SUPERIOR COURT OF THE STATE OF CALIFORNIA
IN AND FOR THE CITY AND COUNTY OF SAN FRANCISCO
HONORABLE WINTON MC KIBBEN, JUDGE PRO TEM PRESIDING
DEPARTMENT X-5
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MILTON J. HOROWITZ, et al.,
Plaintiffs,
vs. No. 965245
RAYBESTOS-MANHATTAN, et al.,
Defendants. /

REPORTER'S TRANSCRIPT OF PROCEEDINGS AUGUST 10, 1995
JURY TRIAL

A P P E A R A N C E S

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P R O C E E D I N G S

THE COURT: Good morning ladies and gentlemen. All of the jurors are present, all counsel. Good morning.

MS. CHABER: Good morning, Your Honor.
At this time, the plaintiff would call to the stand Dr. Samuel Hammar.

SAMUEL HAMMAR, M.D.,

having been called as a witness by the plaintiffs, was duly

sworn and testified upon his oath as follows:

THE CLERK: Would you please state your full name for the record and spell your last name.

THE WITNESS: Samuel Hammar, H-a-m-m-a-r.

DIRECT EXAMINATION BY MS. CHABER

MS. CHABER: Q. Dr. Hammar, could you tell the jury what your occupation is.

A. I'm a pathologist.

Q. And what does a pathologist do?

A. A pathologist is a type of medical doctor that studies diseases and specifically, we make diagnoses of diseases by examining tissues and cells. We also run the clinical laboratory and make diagnoses, or help make diagnoses, by determining abnormalities and things like blood and urine.

Q. What is your present position?

A. I am a staff pathologist at the Harrison Memorial Hospital in Bremerton, Washington, which is relatively close to Seattle. I'm the director of Diagnostic Specialties Laboratory, which is a laboratory that I run in Bremerton. I'm a clinical professor of pathology and environmental sciences at the University of Washington school of medicine in Seattle.

Q. And do you have a specialty within pathology?

A. I do.

Q. What is that?

A. Several specialties, actually, but the main specialty is lung pathology. I also specialize in diagnostic electron microscopy and diagnostic immunohistochemistry.

Q. I think we are going to have to have you -- I think that's going to be a rule, anything that's bigger than 10 letters you have to write up on the board --

A. Okay.

Q. -- and explain.

What is electron microscopy?

A. The electron microscope is a type of microscope that uses electrons as a source of light versus visible lights or light from a light bulb, and it is different than a light microscope, in that it can magnify things a great deal more than an ordinary light microscope can and also can resolve things much better, which means that your ability to see two points as distinct points can be seen much better with an electron microscope than it can with a light microscope.

We could take tissue samples and magnify them up to a

16 million, if we'd like, and we can get a resolution up to
17 five angstrom, which is a very, very tiny distance or tiny
18 measurement.
19 Q. Okay. And the other thing you said besides lung
20 pathology, you said electron microscopy and
21 immunohistochemical analysis?
22 A. Diagnostic immunohistochemistry. And this is a type
23 of technique that pathologists have used now for about 10
or
24 12 years, and we use it primarily in cancer diagnosis.
25 And what it is, is a technique in which we use
26 antibodies to identify substances that are either in or on
a
27 cell. And these antibodies are made most frequently in
28 tissue culture, and they are directed against certain
things

1 inside cells or on the surface of cells that allows one to
2 make, in certain instances, a relatively specific diagnosis
3 of what type of cancer you're dealing with.
4 And the technique is very well-established at the
5 present time. In fact, in our laboratory, we have this
6 automatic machine that does the entire test. All I have to
7 do is select which antibodies I think are appropriate for a
8 given test.
9 And what I see under my microscope, when I look at
the
10 tissue sections, I actually see colors, and the colors
11 represent positive reactions with certain types of
antigens.
12 And then by developing profiles of what types of things
are
13 in or on certain type of cancer cells, I'm able to make a
14 specific diagnosis of what type of cancer an individual
15 person may have.
16 Q. Okay. Is that something that gets used, in terms of
17 the diagnosis of mesothelioma?
18 A. It does. It's something that's very frequently used
19 in the diagnosis of mesothelioma, primarily because at
least
20 in one type of mesothelioma, the epithelial type
frequently
21 looks like other types of cancers. And by using this
22 technique and electron microscopy, one could be very
certain
23 that one is dealing with a mesothelioma and not some other
24 type of cancer.
25 Q. Could you tell the jury your educational background,
26 starting with undergraduate through the present.
27 A. Sure. I went to Eastern Washington State
University,
28 which is a small university close to Spokane, Washington,
in

1 Eastern Washington, from 1961 through 1965, and graduated
2 with a BA degree in chemistry in 1965.
3 I then attended the University of Washington school
of
4 medicine in Seattle from September of 1965 through June of
5 1969, and graduated with an M.D. degree in 1969.
6 Q. And in the course of getting an M.D. degree, did you

have to have specific medical training?
A. Yes, entirely.
Q. And what type of training would that be?
A. You were trained in virtually all aspects of medicine, including internal medicine, surgery, pediatrics, obstetrics and gynecology, psychiatry, and basically everything.
Q. Did you have to do an internship?
A. Yes. After I graduated from the university, I did an internship, and since I knew I was going to become a pathologist, I did what was called a straight pathology internship, in which I started my training in pathology immediately. And that lasted for a year, from July of 1969 through June of 1970.

Then after completing that, I was accepted into the University of Washington affiliated residency program in pathology and was a pathology resident at the university hospital and the associated hospitals there in Seattle from July of 1970 through September of 1973.
Q. Okay. And so then when you completed your residency, then what happens next?
A. After I completed my residency, the first job I took was at the University of Utah. I thought I was going to go

into academic pathology, and I was an assistant professor at the University of Utah school of medicine.

And I was in charge of the electron microscopy service down there and was in charge of surgical pathology at the university hospital in Salt Lake, and I was there from October of 1973 through August of 1975.

And then after that, I decided I missed Seattle a great deal and I wanted to go back to Seattle, so I had the opportunity to take a job at a private hospital in Seattle that was actually a combination of a multi-specialty clinic and hospital together called the Virginia Mason Medical Center, and I took a job there and was at that institution from September of 1975 through January of 1989.

And then in January of 1989, I wanted to do some things at that hospital there in Seattle the Virginia Mason Medical Center didn't want to do any longer, so at that point in time, I moved across Puget Sound to Bremerton, and set up and established a new laboratory where we continued to do these tests that I've referred to, the diagnostic immunohistochemistry and diagnostic electron microscopy, and I have been in Bremerton since February of 1989.
Q. Okay. And Bremerton has a shipyard up there?
A. Yes. The Puget Sound Naval Shipyard is located right at the waterfront as you enter Bremerton from the ferry, and

it's been in existence since the 1940s. And there's a very high incidence of asbestos-related lung disease in Bremerton and in Kitsap County, which is the county that Bremerton is in.

Q. And as a pulmonary pathologist in the Bremerton area, have you seen a number of those cases yourself personally?
A. Yes. In fact, in the last two weeks, I've diagnosed five new cases of mesothelioma in this area. And we have, on an average, of about 15 new cases of mesothelioma every year in Kitsap County, in Bremerton. And I see a lot more than that, because other pathologists in this area will send me consultations of suspected mesothelioma and other asbestos-related lung disease.
Q. Are you Board-certified in any specialty in medicine?
A. I am.
Q. What is what does that mean to be Board-certified?
A. To be Board-certified means that you have to complete a residency program that has been approved by the board that you're going to or the specialty that you're going to become a specialist in, and in my case, it was the American Board of Pathology.

And the residency program that I did my training in was at the University of Washington, and that was one that was approved by the American Board of Pathology. And once you have completed that program, you then have the option, or you have the right, to take an examination, and I took the examination in 1975. It was a three-day examination. And if you pass that exam and after completing the residency, you were then Board-certified.
Q. And you indeed became Board-certified at that time?
A. I became board certified in both anatomic pathology and clinical pathology.

Q. Tell us the difference between anatomic pathology and clinical pathology.
A. Anatomic pathology has to do with diagnosing diseases by looking at cells and tissues. For example, I'm the type of pathologist that if one of you had a biopsy, say a lung biopsy, a breast biopsy, a prostate biopsy, that tissue specimen would be sent to a pathologist like myself.

And what we would do would be to examine that, and we would cut that specimen up and make small slices of the tissue, and we would put them into plastic cassettes, which would go through an automatic tissue processor.

And from that tissue, which would be embedded eventually in a wax paraffin, we would make very thin slices of that tissue, and we would then put them through another automatic stainer, and we'd stain the tissue.

And I would look at the glass slides which have that tissue on it under a microscope, and I would make a

diagnosis, say of lung cancer, breast cancer, prostate cancer, or no cancer, and then I would report that information back to the doctor.

The anatomic pathologist also looks at cytology specimens like Pap smears, sputum, virtually anything, and we also do autopsies to determine causes of death and extent of diseases or causes of diseases.

Clinical pathology has to do with running a laboratory, and our main job as a clinical pathologist is to make sure that the quality control in the laboratory is good, which means that the tests that are done on a person's

serum or urine or whatever, that the tests are accurate. And we do that by having control samples of various types of things that we test on a daily basis, often twice daily, to make sure that our machines are running accurately and that the results are accurate. So my job, as a clinical pathologist, is to make sure that quality control is working.

And then not infrequently, we get asked to interpret tests. For example, if a person was thought to have a heart attack, one of the tests that would be done would be to send a sample of blood that we would take the serum of, and we would test it to see if there was this one type of enzyme present in that serum sample that was elevated. And by doing that, we could diagnose diseases.

Q. Okay. And in the two different aspects, the anatomical pathology and the clinical pathology, do you regularly see patients, the people who are having their lung tissue or other things examined?

A. Infrequently. Occasionally the surgeons, since I'm interested in lung pathology and cancer, will ask me to come into the operating room to look at what they are operating on, and will sometimes ask me where I think they should take a biopsy from, but we generally do not see patients. Sometimes we will see patients if we are going to do, say, a bone marrow biopsy or a fine needle aspiration biopsy, say, of a thyroid mass.

Q. Okay.

A. But not very frequently.

Q. In the normal practice, a pathologist doesn't meet the patient; the treating physician does?

A. That's correct.

Q. In addition to the teaching that you had told us about in Utah before you came back to Seattle, have you done any teaching since then?

A. Yes.

Q. Can you tell us about that?
A. Up until 1991, I taught medical students at the University of Washington school of medicine pathology. I taught them various areas of pathology. I have, for about the last ten years, given courses at the American Society of Clinical Pathology. Myself and another pathologist gave a course in lung pathology at the American Society of Clinical Pathology.

I routinely give talks at another society called the Society of Ultrastructural Pathology, which has to do with the diagnosis of disease with the electron microscope.

I am the president elect of a new society that is going to start this coming March as a companion meeting to the U.S. and Canadian Academy of Pathology, and that's called the Society of Pulmonary Pathology.

Q. Pulmonary pathology is the same as lung pathology?

A. Right. I'll be giving a talk there on a type of cancer that occurs in the lung.

I'm also the person who's responsible for the companion meeting for the Society of Ultrastructural Pathology, and next March in Washington, D.C., we are going

to have a symposium on mesothelioma, which I will be giving a talk at.

Q. And did you have special training in the electron microscope?

A. I did.

Q. Do all pathologists get training in electron microscopy?

A. Very few do.

Q. What type of training did you get?

A. Well, I got very basic training where I had to actually take tissue, fixed tissue, had to process it; would cut the tissue that was embedded in the very hard plastic initially with a glass knife, and then with a diamond knife, cut very thin sections; would have to stain it in a very special way; would have to put it into the electron microscope in a very special way, and look at the tissue.

We'd take photographs of the tissue that I was examining, would learn how to develop the negatives of the film that we took the pictures on, and would present the pictures and then interpret them.

So I was fortunate enough to have this very special training in my pathology residency program.

Q. And then you continued to practice and use the electron microscope after that?

A. Yes. In fact, the electron microscope, because of cost constraints around the country, there are starting to be regionalized centers for doing electron microscopy, and it turns out, for example, that our laboratory does the

electron microscopy work for three hospitals here in San Francisco, and we also do the electron microscopy pathology work for the University of Arizona pathology department.

Q. And what are the three hospitals in San Francisco?

A. The one that used to be the Children's Hospital, and

St. Joseph's Hospital, and one I can't remember the name of.
Q. Have you been engaged in research and publication?
A. Yes.
Q. And can you give us an idea about how many articles you've published in the scientific professional literature over the years?
A. I publish about 80 articles. The last one was just published last month in the seminars in respiratory infections, and I published an article there on a disease called pulmonary granulomatous vasculitis, which is a big name for a fairly uncommon lung disease that involves the blood vessels in the lungs.
Q. What have been the areas of interest that you've done research and publication on?
A. Primarily, they have to do with lung disease and cancer, and those have been the two areas that I've published the most in.
Q. Have you done any publishing regarding asbestos disease?
A. Yes.
Q. And can you give us an idea of the types of articles and the areas?
A. Several articles. In 1986, we published an article on

how the pleura, which is the lining of the lung and chest cavity, reacted to injury, and how one or why one got the immunohistochemical reactions one did with these cells that form the pleura.

A more recent article, in 1993 I published an article in Chest on unusual noncancerous lesions in the lung that mimic cancer.

I have a paper that will be coming out on mesotheliomas in the Journal of Ultrastructural Pathology that has to do with an unusual reaction that certain mesotheliomas have. It's called they are mucin-positive, which doesn't mean anything to anybody here, but it's something that can be mistaken if you don't understand that that can happen.
Q. It's one of the tests that get done to differentiate a mesothelioma from other cancers?
A. Yes.
Q. And sometimes the result is different than what you'd expect, and it's still a mesothelioma?
A. Correct.
Q. Have you published any or edited any books?
A. I have. I've been a co-editor of a textbook on lung pathology. Second edition was published in January of 1994.
Q. And that's these books here?
A. Right.
Q. And how far apart were these books published from each other? There's a first edition and a second edition?
A. First edition was published in 1988 and the second

edition in 1994, so six years apart.
Q. Is that a fairly short time for a change in a medical textbook?
A. Fairly short. We thought that because there's been so much new in pulmonary pathology in that six-year period, we thought it was time to do that. And the next edition, which we already are planning, will be published, probably, I'd say, in either 1999 or the year 2000.
Q. So the medicine is changing or the knowledge about pulmonary lung disease is changing?
A. Yes, it's constantly changing, and there's new things all the time. There's some very interesting new things on mesothelioma that have been published just in the last few months. There's an interesting new cart article that was published on some of the types of cancers that occur in the lung which is different than what people thought happened, and so there's a lot of new things that continually keep coming along that need to be updated.
Q. And do you try to stay current in things that other people are writing?
A. Yes. I subscribe to probably about 10 or 12 journals, scientific journals that deal with medicine and pathology.
Q. Do you also do literature searches for journals that you don't subscribe to?
A. Constantly. There's a program that's called "Knowledge Finder," which is a program that is on a CD ROM disc that accesses all the journals that are published in the National Library of Science. You can access basically

every literature that exists concerning any topic you want that has to do with medicine.
Q. And in this textbook on lung pathology, did you write any -- did you only edit it, or did you write any of the chapters?
A. No, I wrote five of the chapters, one of which was in association with another person.
Q. And were any of the chapters that you wrote relating to asbestos disease?
A. Yes. Chapter 28 is titled "Asbestos," and that was written by myself and Dr. Ronald F. Dodson, D-o-d-s-o-n, who's a Ph.D. scientist in Tyler, Texas. He's head of subbiology and environmental sciences at the University of Texas at Tyler, and he and I are collaborating in several research projects.
And we wrote the chapter that had to do with asbestos, chapter 32, in that book is called "Common Neoplasms," and a neoplasm means a new growth. And basically, it's synonymous with cancer. And that chapter deals with the common cancers of the lung, all of which are caused by asbestos.
Chapter 34 is called "Pleural Diseases," and the majority of that chapter is devoted to a very thorough discussion on the type of cancer that's called mesothelioma,

which is a cancer of the lining of the lung, or the lining of the abdominal cavity or the heart cavity.
Q. And in developing your expertise, have you had occasion and reason to review epidemiologic scientific literature?

A. I have, yes.
Q. This time I said it, but I'm going to ask you to write that word up there. What does "epidemiologic" mean?
A. That's a field or a discipline in which studies are done in large groups of people. And when it relates to medicine, it's usually done to determine causes of diseases.
And what you do is compare large groups of people with respect to a certain factor, say, for example, cigarette smoke. The way it was determined that cigarette smoke caused lung cancer was they found a much higher incidence of lung cancer in groups of people who were cigarette smokers versus people who did not smoke, and that would be an epidemiologic-type study where they would compare large groups of people who did certain things, or had certain factors common to them, versus another group of people who were controlled for age, sex, and maybe some other things that didn't have this one factor in common.
And then they would look at those two groups with respect to certain disease conditions and make certain deductions from that information.
Q. And is there any epidemiology on asbestos diseases?
A. Extensive.
Q. And have you tried to keep current in that?
A. Yes, I have.
Q. In addition to the books that I have on the table, have you edited any other books?
A. I haven't edited any other books. I've been a contributor to several other books, and one that was just

published this year in Great Britain was called Practical Pulmonary Pathology, and that was edited by Dr. Shepphard, who's a pathologist in London. And she asked me to write the chapter on mesothelioma, which is Chapter 13, which I did.
I also wrote a chapter in a book that was edited by Dr. Valerie Raush, who's a thoracic surgeon at the Sloan Kettering Cancer Center in New York City, and that was on pleural diseases, diseases of the lining of the lung and chest cavity.
I also wrote a chapter on a book that's going to be published on environmental medicine, the editors of which are in San Francisco. One of whom that I worked with is Dr. John Balmes, who's the head of environmental medicine at the University of California at San Francisco here in San Francisco.
Q. Now, are you familiar with some of the major journals on the topic of cancer?
A. Very much so.
Q. Are you familiar with a journal called Cancer

Research?
A. Yes.
Q. And what type of reputation does that journal have?
MR. SKWRAO: Objection, Your Honor; relevance, lack of foundation.
THE COURT: I assume it's relevant. Overruled.
THE WITNESS: It has an excellent reputation. It has a journal that publishes original articles and also

publishes reviews. One of the reviews I read in that journal fairly recently was on what's called P 53, which is what's referred to as an anti-oncogene, or a tumor suppressor gene, and that was kind of the definitive review article on that.

And that is thought to be very important at the present time in all kinds of cancer, because various carcinogens, such as cigarette smoke, causes mutations in that gene, which leads to an abnormal protein product being produced which makes people perhaps more susceptible to the development of cancer.

MS. CHABER: Q. And have you ever -- what's a peer review journal? What does that mean?
A. A peer review journal is something that most medical journals are. And what that means is that say I wanted to publish an article in a journal called Human Pathology, which I have and do on occasion.

And what I would do is to send the manuscript that I wanted to get published in that journal to the editor of that journal. And the editor of that journal then has an editorial board, and he or she would then send that paper to two, sometimes three, of the editorial board or other people that the editor knew were experts in that area which the manuscript applied to.

And those individuals would review that manuscript to see if it was scientifically sound, made sense, was important, and if it did, they would then suggest any corrections or changes be made that would make it better or

clearer, and would send that information back to the editor saying: This article is acceptable for publication. So one of your peers has reviewed that and found it to be okay.

There's also the possibility that they think it was lousy and it wasn't okay, and they would send it back to the editor and say: This is not acceptable for publication.

Q. And have you ever served as a peer reviewer for articles?
A. Very often. The last article I reviewed was sent to me from the journal called Cancer, and it had to do with the incidence of cancer in first-degree relatives of people who had mesothelioma.

Q. And first-degree relatives are what, children and brothers and sisters?
A. Brothers, sisters, father, mother.
Q. Do journals ever reject articles, not because of their scientific merit, but because it's not a topic that they are interested in?
A. They do, and that's one of the things that one has to very carefully consider when you submit an article to a journal, what would be the appropriate journal to have that published in.

For example, if you wanted to have something published -- you had an article, say, on the interstitial pulmonary fibrosis that had to do with a noncancerous type of disease, you wouldn't want to send that type of article to a cancer journal unless it's somehow specifically applied to cancer.

And you really have to kind of figure out what would be the appropriate journal to send an article to, specifically thinking about the people who read that journal, what would they be interested in, would they be interested in this type of article.
Q. And have you ever had an article that was rejected by one journal, but accepted by another?
A. Yes, I have.
Q. Do you serve on any panels or any societies with relation to mesothelioma?
A. I do.
Q. And what is that?
A. It's called the U.S. and Canadian Mesothelioma Panel. It's a panel made up of ten pathologists, two in Canada, eight in the United States. And what our job is, is to accept cases from pathologists in the United States and Canada and, actually, all over the world, of cases that they think might represent mesotheliomas.

And the reason such a panel exists is because mesothelioma, overall, is a rare type of cancer, and many pathologists have not had the ability or the experience in diagnosing this type of cancer and therefore, haven't seen all of the various ways that mesothelioma can look.

So what they can do is send the slides and blocks of tissue specimens obtained from patients to our panel, and they send it initially to the chairman of the panel, who's Dr. Churg, in Vancouver, British Columbia. Dr. Churg would then distribute the material to the members of the panel.

And I would then fill out a one-page sheet of information indicating whether I thought this process that was present in the slides was or was not malignant, and if it was malignant, did I think it was a mesothelioma or not a mesothelioma. If I thought it was a mesothelioma, what type

of a mesothelioma was it. If it was not a mesothelioma but was a cancer, what type of cancer did I think it was, and then there's a place to write some comments.

And then I would send that back to Dr. Churg, who would then distribute that information to the person who sent the case in. And this is done at no charge to the pathologist who submits the case.

Q. And do you work with a group out of the University of California San Francisco with respect to a research project they are doing?

A. Yes. They are one of the institutions that are involved in what's called the Caret study, C-a-r-e-t, and that has to do with cisretinoic acid and beta carotene efficacy trial.

Q. Whoa, whoa, whoa. Can you tell us that in something less than those terms?

A. It's actually fairly simple. There are vitamins that are thought to be antioxidants, and I'm sure probably everybody's heard of antioxidants.

And there are these substances that get in your body and your bloodstream that are called oxidants, or oxidizing agents that are thought to injure cells that can lead to cancer. And there are certain vitamins or certain

substances that prevent the injury to cells by these oxidizing oxidant-type agents. They are sometimes referred to as free radicals.

And what we are trying to determine is if two common vitamins, beta carotene and vitamin A prevent the development of cancer and mesothelioma, lung cancer and mesothelioma, in people who have been exposed to cigarette smoke and/or asbestos.

And this study has been going on now for about five years. The main center for this is in Seattle at the Fred Hutchinson Cancer Research Center. There are satellite institutions here in San Francisco, one in Portland, Oregon, another in Baltimore, and I think there's one more.

And I have been involved in that as the pathologist who reviews the cases to make sure that the conditions of the cancers are diagnosed correctly so we will have a handle on whether or not these vitamins do or do not prevent these diseases from happening.

Q. And how long is the study expected to go on?

A. The statisticians say it will take another five years to determine whether these vitamins help reduce the incidence of lung cancer and mesothelioma in these people.

Q. And why will it take so long to make that conclusion?

A. It takes a long time because, number one, you have to get a certain number of people to study, and that you compare with a group of people who have not had these vitamins. It's done in a double blind way, although usually

28 the people that take the beta carotene often turn a little

1 bit yellow sometimes, so often they know, but it's done in
a
2 double blind way so theoretically, the researcher and the
3 person who's receiving this does not know what they get.
4 And it's done in a blinded manner so you'll give one
5 person vitamins and another one not the vitamins, and you
6 won't know which had which, and then you'll look to see
7 which group has the highest incidence of cancer and
8 mesothelioma, or if there's any difference in these two.
9 And it just takes that long to get enough people to
do
10 this comparison, to have something that you can perform
11 statistical analysis on, to determine if there is a
12 significant effect or not a significant effect.
13 Q. And are you involved with the National Research and
14 the Staging of Lung Cancer?
15 A. I was extensively involved in that, and Dr. Raush
just
16 published, for example, an article that's going to come on
17 on the staging of mesothelioma, which I was a participant
18 in.
19 Between 1977 and 1989, I was the chairman of the
20 pathology section of the lung cancer study group, which
21 studied new ways to treat lung cancer, and my job was to
22 make sure that the cancers were accurately diagnosed and
23 accurately staged.
24 Q. What does "staging" mean?
25 A. Staging means to determine the extent of the
disease.
26 And basically it's called a TNM classification. T stands
27 for tumor, N stands for lymph node, M stands for
metastases.
28 Anyone who gets a cancer at the present time, no matter
what

1 kind it is, it's staged according to this TN and M
2 classification.
3 And the reason that it is, is because the prognosis
4 and the therapy is dependent on the anatomic stage of the
5 disease, which means that it's dependent on how advanced or
6 not advanced that disease is.
7 For example, if you had a lung cancer, say, in your
8 left upper lobe right here, and that measured less than
9 three centimeters in diameter and there was no spread to
the
10 lymph nodes in the center of the chest and no evidence of
11 spread to other parts of the body, the only treatment that
12 that person would need would be surgical resection.
13 In contrast, if there was metastases to the lymph
14 nodes or direct invasion into the center of the chest,
that
15 person would frequently get radiation therapy and
16 chemotherapy as adjuvant forms of therapy to treat that
17 cancer, because that would be a more advanced stage.
18 Q. And does it vary from, sort of, organ to organ on
the
19 treatability of cancers?
20 A. Very much so. There are certain types of cancers
that

21 are very treatable. Breast cancer, prostate cancer,
22 lymphomas, and there's some type of cancer that you wonder
23 if it's even worth treating them at all.
24 Q. And does mesothelioma fall in that latter category?
25 A. Unfortunately, it does.
26 Q. What kinds of ongoing research projects do you have?
27 A. Several. One that we are almost done with right now
28 has to do with mesothelioma, in which we are looking --
and

1 I say we, Dr. Dodson, who's in Tyler, Texas and myself --
2 are looking at asbestos fiber concentrations in the lung
3 tissue of people who have had mesothelioma from the
4 northwest, basically where I work.
5 And we are trying to determine what the most common
6 fiber is that causes mesothelioma, or at least is in the
7 lung tissue of people who have mesothelioma from the
8 northwest area, and we are trying to see what type of
9 concentrations one gets in these group of people who have
10 it, and we are looking at 50 people. And we are almost
11 finished with that, and we have some data that is
12 interesting.
13 And then the other thing we are doing, which is kind
14 of a side line of this, but potentially more important, is
15 that we are not only looking at the lung tissue for the
16 concentration of asbestos in that, but we are also looking
17 at the concentration of asbestos in the lining of the lung
18 and lining of the chest cavity, which is called the
pleura.
19 We are also looking at the concentration of asbestos
20 in the lymph nodes, which drains the lung, and we are
21 looking at the concentration to see if there is any
asbestos
22 in the tumor itself, the mesothelioma itself.
23 And also, another type of condition that is
frequently
24 associated with mesothelioma, but has nothing to do with
it,
25 which is referred to as hyaline pleural plaques, which are
26 these very discrete areas of pleural thickening along the
27 chest cavity.
28 And what we are really interested in is what is the

1 variation and concentration you see. And there's somewhat
2 of a debate right now if what's the most important thing,
3 whether it's the concentration of the asbestos in the
pleura
4 where the tumor begins, or whether it's the concentration
of
5 asbestos in the lung that may act indirectly to cause
6 mesothelioma, and we are very interested in finding that.
7 And then we are also looking at to see if we can find
8 any asbestos fibers or asbestos bodies in pleural fluid.
9 Certain people that have been exposed to asbestos develop
10 pleural effusions, which means that they develop fluid in
11 the chest cavity between their lungs, and that compresses
12 the lung.
13 And it's a very common finding in people who develop
14 mesotheliomas or who have benign asbestos disease. And it
15 can be a very difficult thing to diagnose. And
frequently,

people who are eventually diagnosed, say with mesothelioma or this asbestos-related benign disease, can initially be diagnosed as having an infection and treated with a bunch of drugs that they don't need to be treated with because the findings in this fluid are nondiagnostic, are nonspecific.

So what we are looking at is a group of pleural fluids that come into the hospital in which I work, some of which are associated with mesothelioma or asbestos, many of which are not, to see if we can identify asbestos fibers in that pleural fluid.

Q. Okay. And then if you find them, then you'll know that that's a person that doesn't need, or for whom the treatments of antibiotics and so forth wouldn't be

effective?

A. Right. What we have kind of found, and what we think we are going to find, is that the people who have, say, the asbestos pleural effusions will probably have fibers in that fluid, but the people who have effusions for other reasons, such as congestive heart failure or infection or other things like that, will not have the asbestos in them.

Q. And in addition to your research work, you've made a number of presentations. You talked about some that are upcoming. Have you made any about asbestos-related diseases in the last couple of years?

A. Several.

Q. Can you tell us about those.

A. They have mainly had to do with lung cancer and mesothelioma. In Australia, and I guess the last one was in Hong Kong last October, myself and a pathologist from Sloan Kettering in New York City presented a course on the use of electron microscopy in diagnostic pathology. And what I did was primarily talk about cancers. I showed several examples of mesothelioma and how the electron microscope is useful in diagnosing that disease.

I've done others in Australia about a year before that which we gave, again, a course or a talk for the Australian Society of Electron Microscopy. I talked about asbestos-related disease there. And that is pertinent there, because the highest incidence of mesothelioma in the world at the present time is in Australia.

And coming up --

Q. Is there some particular association in Australia with these mesotheliomas?

A. Yes. There's two reasons. In Australia, one is that

in Western Australia, about a thousand miles north of Perth -- and Perth is on the West Coast of Australia, sometimes said to be analogous to LA, although it's nothing like Los Angeles -- but about a thousand miles north of that, which would be towards the equator, there was a mine called the Wittenoom Mine, and that was in operation from, I think, about the late -- either the late '40s or early '50s, until some time in the '60s, as I recall.

Q. What were they mining?

A. They were mining blue asbestos, crocidolite asbestos.

And I know the pathologists over there in Perth and also South Australia, and they see a very high incidence of mesotheliomas a result of that, and also as a result of the fact that Australia, like many countries, imported a great deal of asbestos into their country for various uses.

Q. And you were going to say another one, and I interrupted you.

A. In 1996, I've been invited to go to Budapest to talk on mesothelioma, and I'm going to present two very unusual cases that are uncommon types of mesothelioma at that conference. And the person who's heading that conference is Dr. Henderson, who is the chairman of pathology at the Flinders University in South Australia, and he and I have become friends over the years, and I'm going to go present two cases of unusual mesothelioma at that conference.

Q. And in addition to your research work and your publishing work and the clinical work that you do, have you also appeared as an expert witness, such as you are today, in cases?

A. I have, yes.

Q. And can you give us an idea of the relative percentages of the time that you spend on the various activities that you do?

A. I would say about 30 to 40 percent of my present time reviewing cases have to do with asbestos-related lung disease, primarily, that are sent to me from attorneys. The other 60 to 70 percent of the time is doing consultation work of cases I'm sent by on the pathologists, doing ordinary, routine, hospital pathology-type work, and that takes up most of my time.

Q. And the research and publication work?

A. That's usually done on weekends and at night, and that kind of is besides that.

Q. So it can add up to more than a hundred percent?

A. I guess it could.

Q. I won't ask you how your family feels about that.

In terms of work that you do for cases in asbestos litigation, how did you get involved in that?

A. In October of 1985, an attorney in a law office in Seattle -- the name of the law office was Ogden, Murphy and Wallace at that time. It's now called Ogden, Ogden and Murphy -- his name is Robert Andre, A-n-d-r-e, he was the lead counsel for Johns-Manville, and he called me up and

asked if I would do an autopsy on a person, who had obviously died, who was suspected of having an asbestos-related lung cancer. And I did that autopsy for him, and that's how I got started, and I continued.
Q. When you first started, you started doing work at the request of attorneys representing manufacturers of asbestos products?
A. I did, yes.
Q. And has that changed over the years?
A. It has.
Q. And do you know why that's changed?
MR. BRAKE: Objection. I think that calls for potentially prejudicial speculation. That has nothing to do with my client.
THE COURT: If he knows, I think he can answer.
THE WITNESS: About a year after I started working for Mr. Andre, Mr. Andre had a conference in Seattle, and the conference had to do with asbestos diseases. And it turned out that a couple of attorneys from San Francisco attended that conference, and they came up to me afterwards and asked me if I would review cases for them. And they happened to be plaintiffs' attorneys, and I said I would review cases for either side, and that they are going to get the same result.
So at that time, I started getting cases, it was Mr. Brayton who works in this area, started sending me cases. And then over a period of time, I started doing more cases for the plaintiffs' side than for the defense side

over the years. At this time, I do probably 90 plus percent for the plaintiff and less than five percent, maybe less than two percent for the defense.
Q. Do you do other types of review pathology for other types of cases besides asbestos?
A. Occasionally. I have reviewed cases for the Washington State Labors and Industries Association. They have used me as a referee on cases of lung disease claims in which a person has claimed that they have a certain disease due to a certain agent. And they have sent me those cases and asked me to review them and usually accept what I say as the result of -- the final result of that claim with respect to the diagnosis, that is.
Q. Okay. And you don't spend 30 to 40 percent of your time testifying, do you?
A. No, the vast majority of the time is spent actually looking at these cases. And that's something that I like and I do for maybe another reason besides coming down here.
And the main reason I suspect I do that is it provides me with a great deal of material that I can do research on and

look at, and that's something that I happen to be interested in. And by having these cases to review, I also have this material to do research on.

Q. Can you give us an idea of the number of mesotheliomas you've seen over the years?

A. We are up to about 600 now in the U.S. Canadian Mesothelioma Panel of these cases suspected of mesothelioma.

I would estimate between 2,500 to 3,000 cases.

Q. And can you give us an idea about how many cases of mesothelioma there are in the United States in a given year?

A. There's supposed to be between about 1,500 to 2,000 new cases diagnosed in the United States every year. There's some evidence right now, and it's not known why, that this disease may be increasing in the United States, and there's been some controversy about that.

Q. The numbers appear to be getting larger of the reported mesotheliomas?

A. Yes, and that's certainly in my own experience. And this may not be truly an increased number of cases, it could be that people are finally learning to recognize this disease and diagnose it accurately. And as a result of that, there seems like there's an increase in cases, but it may be that just the cases are now being accurately diagnosed and recognized, and there really isn't an increase in cases.

Q. It may be just that the diagnostic techniques are getting known by more doctors and the diagnosis made?

A. Yes.

MS. CHABER: At this time, Your Honor, I would offer Dr. Hammar as an expert in lung pathology, in asbestos-related diseases, including mesothelioma.

THE COURT: All right. Any questions of him?

MR. OHLEMEYER: Not at this time, Your Honor.

THE COURT: Very good. Yes, he's so qualified.

MS. CHABER: Q. Dr. Hammar, as the first witness and the first medical witness, can you give us a start, in terms of the lungs, can you describe the respiratory system and how it works?

A. Sure. The main function of the lung, which I think everybody knows, is gas exchange. There are also some other functions, but the main function is gas exchange, which basically, when we breathe, we breathe air into our lungs which contain approximately 20 percent oxygen.

And the oxygen diffuses across this thin membrane, that I will show you, into the blood and attaches to the hemoglobin, which is presents in the red blood cells. The blood then carries the oxygen in the hemoglobin molecule to the rest of our bodies, and that oxygen is used for

cellular
13 metabolism.
14 A by-product of the cellular metabolism is called
15 carbon dioxide, and carbon dioxide also gets in the blood,
16 and then diffuses from the blood into the lung, and as we
17 breathe out, carbon dioxide goes out. We breathe in, the
18 oxygen comes in.
19 And the way this all happens is that our mouth and
our
20 nose are connected to the lungs through a pipe here that
21 sometimes is referred to as the windpipe. Scientific name
22 for it is the trachea. And your larynx is right in the
23 trachea. That's where your vocal cords are.
24 And the trachea goes down into the chest area right
25 here. And the chest is actually a closed cavity that is
26 lined by tissue that's very important. That's called the
27 pleura. I'll show you that, but this trachea goes down
and
28 divides into two main tubes right here. One is referred
to

1 as the right main stem bronchus. This would be the right
2 side of the person right here. I'll just abbrievate that,
3 right main stem bronchus, RMB, and the other main division
4 is called the left main stem bronchus.
5 Q. So we are -- this person that you're drawing is
facing
6 us?
7 A. Yes. This would be the person's head up here. This
8 would be the right arm, this would be the left arm.
9 I'm just going to draw the lungs in here, kind of
10 crudely. This is where the heart is.
11 So these tubes go down, and they divide into these
two
12 main tubes, and then these tubes just go more and more
13 branches, and they go to two lobes on the left side. This
14 is called the left lower lobe. This is called the left
15 upper lobe.
16 Q. And the lobe is a part of the lung?
17 A. Yes, part of the lung. And you have these two main
18 branches that go to the lobes, and these keep dividing
into
19 smaller and smaller passages until you get out to the
outer
20 part of the lung, which I will show you in greater detail.
21 And then in the right lung, you have three lobes.
You
22 have a right upper lobe, you have a right middle lobe, and
23 you have a right lower lobe. And these tubes, again,
branch
24 and get smaller as they go out towards the outer part of
the
25 lung.
26 And the gas exchange part of the lung occurs in
these
27 structures that are referred to as alveoli. And these
kind
28 of look like little grape-like sacs. And these alveoli

1 would be way out here, or actually -- and these are greatly
2 exaggerated.

Q. They are microscopic, aren't they?
A. Yes, they are. But these alveolar sacs here have walls in them that are referred to as alveolar septa. And in these alveolar septa are the blood vessels, the capillaries where the blood is. And I'll just draw that in red to indicate these are capillaries.

And when you breathe in or when you take air into your lungs and get it out here, the gas goes into these air sacs here and then the gas diffuses, which just means by passive movement due to concentration gradients, it moves from the inside of this air sac across this alveolar septa into the blood vessel where the oxygen -- I mean where the red blood cells are that have the hemoglobin, and they clump onto the oxygen. And at the same time, the carbon dioxide that's in the blood goes into the air sac, and what you breathe out just goes out.

So that is the main function of the lung, which is gas exchange. And by this happening correctly, we all are able to live, basically.

Q. And that's all happening at a very microscopic level?

A. It's all happening at a very microscopic level, and it's obviously something that we don't really think about very much. Obviously, when you consciously think about breathing, you can feel yourself breathing, but most of the time it's done automatically.

And then the other part of the lung, or a very

important part of it which actually engages the lung, or is very important in having all this happen, is the pleura. And you can kind of think about the pleura this way, is that initially when the body develops, you have this one central cavity that is present, and the lung actually develops from the primitive gastrointestinal tract, your intestine.

And this cavity right here is separated by membranes into three cavities. And right down here is one membrane, which is part of the diaphragm, and that's called the pleural peritoneal membrane, and that separates the chest cavity, which is here, from the abdominal cavity here. And then there's another lining around the heart, and that also is called the pleural pericardial membrane, and that separates out the heart from the chest cavity.

And the pleura is a mass, initially, of just connective tissue, just loose connective tissue, and the lung actually grows into it. And as a result of that, this connective tissue surrounds the lung and also lines the chest cavity.

So what you actually have is two layers of this tissue

that we refer to as pleura. And I'm going to draw that like this. And the outer layer, which is the layer that actually lines your chest cavity, which you obviously can't see here, that's referred to scientifically as the parietal pleura.

And the lining that actually covers the lung, which is very important, because by doing this, the oxygen or the air that's breathed into the lung cannot escape out of the lung, that lining there is called the visceral pleura.

Q. You're showing this as being one continuous --
A. Yes.
Q. -- surface?
A. Right. It actually is. If you were to stick your finger into a balloon, there would be something that would cover your finger, and then there would be this other thing around it.

And then the space that actually is greatly exaggerated here on this diagram here that's between the visceral pleura and the parietal pleura, that is referred to as the pleural cavity, or the pleural space.

Q. And in a normal person, how big is that pleural space?
A. You can't really even seen see it. It's almost nonexistent. If we look at what type of tissue forms the pleura, it actually is formed by a layer of cells that are very kind of flattened, or kind of rectangular in appearance, and those individual cells there, of which there are millions, actually zillions of them, those are called the mesothelial cells. And they are present both on the parietal pleura and they are present on the visceral pleura.

And the little dots in the center is the nucleus of the cell where the DNA which controls the cell and tells it what to do, or what type of proteins, or whatever, to make.

And these cells right here normally do one very important thing. They probably have a variety of functions, but one very important function is they produce a type of substance that is called a proteal glycan.

Q. What's that?

A. That is a big name for a substance that has a lot of carbohydrate in it and some protein. And the main one that it produces, probably two ones, one is called hyaluronic acid, and another one is called dermatin sulfate.
Q. And why is that important?
A. That's important because what this is, is a very gooey substance. And it actually kind of can soak up water, but it actually coats the lining here of these mesothelial cells

and makes them very slick.
And one of the things that happens when you breathe is your lungs move up and down, and this actually acts like a lubricant, like oil in your car engine. So when your lungs move up and down, there's no friction produced, and that happens very smoothly. That's one of the main functions.
The other part of the pleura that is not drawn here, but which is very important, is that there are some connective tissue cells, and I'm just going to draw those in red, which are the spindle-shaped cells, elongated cells, and they are also part of this lining of the pleura.
And mesotheliomas, which are cancers of the lining of the lung, are derived from these cells. They are derived from these type of cells here, and they are derived from these connective tissue cells. And if they are derived from these type of cells, you're going to have what is referred to as an epithelial mesothelioma. And if they are derived from these connective tissue cells, they are referred to as a sarcomatoid, or a fibrous mesothelioma. And there are some mesotheliomas that actually have combinations of both

of those.
And then there's a rare type of mesothelioma that is kind of a variant of this one that looks very bland. So that's how mesotheliomas are derived from. And how they develop is that when the pleura is injured, say from asbestos, these cells start to change.
And asbestos changes these cells from normal cells that are under very strict growth control mechanisms into malignant cells. And malignant cells, they have the ability to do a couple different things. They can grow uncontrollably. They don't have normal growth control mechanisms which says that after so long, you can't grow anymore and you have to stop, they don't have that mechanism. And the other thing is that these cells, unlike normal cells, can invade tissue that normal cells would never do.
So when you develop a mesothelioma, what you usually see initially is you see multiple small nodules of these cancer cells on the pleura, and they often initially can be multiple small nodules. And then over a period of time, these nodules will coalesce.
Q. What does coalesce mean?
A. Coalesce means they will grow together. They will grow together and they will form this what is referred to as a rind. It's like a bacon rind, a rind of tumor, that obliterates this pleural space. And over a period of time, and we don't know exactly how long this is, will completely encase this lung and basically make this a nonfunctioning

lung.

And as time goes on, this tumor, this mesothelioma, can invade into the lung to produce very large nodules. It can metastasize to the lymph nodes which are in this area right here. It can grow the other way into the chest wall and actually grow out through the skin, or it can spread to other parts of the body, such as the bone, liver, the kidneys, adrenal glands, even the brain.

Q. When the mesothelioma is growing like that and encasing the lung, can it grow around the heart border, as well?

A. It does. In fact, one of the very frequent things that happens is that you get fusion here of the pleura and the heart membrane, which is called the pericardium. And I have photographs, and I show some in that book there, where you actually can see the tumor will invade directly into the pericardium and sometimes invade directly into the heart muscle itself, that actually is your heart that pumps the blood.

Q. So what problems does that cause?

A. Very severe problems. Initially, what the problem that this causes, when you usually have these little nodules, the person most frequently will present with shortness of breath, and the shortness of breath is due to the fact that this tumor somehow causes pleural fluid or fluid to accumulate in this space here called the pleural space.

And that will compress the lung, so this lung will

actually, like an accordian, will actually compress like that so it's not functional anymore, and the person does not have that lung mass to use for oxygen exchange, and they will be come short of breath when they do activities like walking up a hill, walking up stairs.

And then as time goes on and this tumor grows greater, the next most common symptom that they will develop is pain, and they will develop pain in the chest, because the tumor is invading into the chest wall or into the lung. And there are nerve fragments there that are irritated or invaded by the cancer.

And then over a period of time when this tumor develops, it will basically make this lung nonfunctional.

Q. Won't be able to move?

A. Won't be able to move, and this lung will develop infection in it, which is called pneumonia. The person will develop pneumonia in this lung, and that's usually kind of the final straw which causes their death.

The other thing that could happen, of course, is that this tumor can invade into the heart and it can spread to other parts of the body.

Q. And you had talked about pleural effusions?

A. Yes.

Q. What is that?
A. It is the collection of fluid in this pleural cavity which is seen, I would say, in over 90 percent, 95 percent of all people who are eventually diagnosed as having mesothelioma. That's, by far, the most common sign that

they are identified as having when they come into a doctor.

The person with mesothelioma usually will present to the doctor because they are short of breath on exertion, and the doctor will initially think it's maybe an infection or something, and they will do a chest x-ray, and the chest x-ray will show what's called a whiteout, in which this entire area, rather than being black, due to all the air in there, will be white because all of the fluid has formed in there and inhibits the x-ray from penetrating it.

Q. Okay. And when the mesothelioma is encasing the lung, does it ever go along the diaphragm portion of the lung?

A. It almost always does. Let's continue this down. It almost always goes down here. And one thing that commonly happens -- I've done about a hundred autopsies on people with mesothelioma, and one very common thing is that this tumor will actually penetrate through the diaphragm, which is right here, into the abdominal cavity and will involve the liver, and sometimes it can spread throughout the abdominal cavity, as well.

Q. And when the portion next to the diaphragm is encased in tumor like that, what does that do -- first of all, what's the function of the diaphragm?

A. The function of the diaphragm is a muscle of respiration, and when the diaphragm is infiltrated like that, it can no longer serve as a muscle of respiration and it will be fixed, and often the clinicians will state that one of the diaphrams on the side of the tumor is not moving anymore, and that's due to the tumor.

Q. Now, are there other diseases that affect the pleura that are not cancerous?

A. Yes, there are a whole other group of diseases caused by asbestos that do not affect the pleura and some that are benign that do affect the pleura. And you could actually group the asbestos-related diseases into two major categories. One we will just call cancerous, and one we just talked about is mesothelioma.

Q. What's the first one?

A. Cancerous, o-u-s, diseases. Mesothelioma would be the one we just described. And then the other major one would be lung cancer.

And then there are a group of other ones which I would say are somewhat controversial with respect to whether they are or are not caused by asbestos, but these would include laryngeal cancer, gastrointestinal cancer and renal, kidney

cancer.
And then on the noncancerous diseases, the one that's most frequently caused by asbestos is referred to as hyaline pleural plaque, or pleural plaques.
Q. Let me just stop you there for a second. When you say pleural plaques, is that pleural as in the word meaning two?
A. No, it's actually due to the anatomic location. And pleural plaques are areas -- let me draw the pleura here. Again, this is the pleura, the green area.
The pleural plaques are areas of very dense scarring that occur on the parietal pleura, and the most commonplace that the pleural plaques occur are on the diaphragmatic

leaves. And these are areas are very dense scarring that are extremely well-circumscribed, which means that if they often just have very sharp margins, and they occur most frequently on the diaphrams.
And next most commonplace they would occur would be in the lower thoracic parietal pleura. Often they run, for reasons that are not known, in the distribution of your ribs, they will run right along the ribs, and that's what pleural plaques are.
Q. I need to stop you there, but I wanted to make sure we were talking about same thing. And then the other benign -- and by "benign," we mean noncancerous?
A. Noncancerous. And the other conditions -- I'll maybe list them all -- would be visceral pleural fibrosis, which would be scarring of the visceral pleura.
Q. That's the one that's right next to the lung?
A. Right.
Q. The plaques occur actually on the lining that's next to the chest wall?
A. Yes.
Q. So really, on the outer part of that?
A. Yes. What people have shown, the person I do research with, Dr. Dodson, is you can identify asbestos in those plaques, which is thought to be why they occur there. The asbestos initiates an inflammatory process that then goes to scarring and formation of this plaque.
There's a kind of an uncommon type of disease called round atelectasis. That's an invasion of the pleura

producing this nodule that is often diagnosed radiographically as a cancer.
And then the next one that, perhaps, is the most important is asbestosis, which is, by definition, is scarring of the lung tissue itself caused by asbestos, in which the asbestos gets into the outer parts of the lungs, it initiates an inflammatory type of reaction, the end product of which is scarring. That occurs in some

individuals who are exposed.
And then finally, we've talked about that pleural effusion, and that is the collection of fluid in the pleural space as a result of asbestos that is thought to irritate the pleura.
Q. And are each of these separate diseases?
A. Yes, they are separate, but they often occur together, or they can occur together.
Q. When they occur together, is it because one caused the other?
A. No, they are independent with respect to causation. They are associated because asbestos causes all of them.
Q. Okay.
A. Or potentially causes all of them.
Q. And going back to your drawing, how would the asbestos fibers get out to the lining of the lungs against the chest wall?
A. That's a good question. What happens is that most of the time, people who get these diseases are exposed to asbestos dust. The asbestos is suspended in the air and

forms a dust that, depending on the concentration, may or may not be visible.
If it's very dusty, it would be a cloud of dust, like everybody has seen, and those people would be working in an area where they would breathe that dust into their lungs. And much of the dust would be collected on these airways here and wouldn't get down to the outer part of the lungs, but some of these fibers would get out in the outer portion of the lung.
And where they first are thought to actually lodge is in the region of what's called the respiratory bronchial, which is a very small air tube less than two millimeters in diameter, and another air tube called an alveolar duct, which is a continuation of this respiratory bronchial.
Q. This is before it gets down to the sac where the air exchanges?
A. Right. It usually would lodge right into this area right here, and all these red things are asbestos fibers. And then it's been shown that asbestos can, probably, physically move by itself in tissue. It can actually move. And the way it moves is not exactly understood.
Or the other thing that can happen is these fibers can get into your lymphatic system.
Q. What's that?
A. The lymphatic system is a group of vascular channels that are connected throughout the body, and they have a very important function, because they connect up with lymph nodes, and they are a part of your immune system and also

part of your clearance mechanism.
And these lymphatic channels are heavily present throughout the lung. They get into the pleura, and these fibers can actually penetrate into these lymph vessels. I'll just draw one like that. It's greatly exaggerated. And these lymph vessels travel along the bronchi and the vessels here, and they can get out into the pleura.
So the asbestos fibers that lodge initially in the region of the respiratory bronchial or the alveolar duct can either directly move into the region of the pleura, or they can enter these lymphatic channels and get carried to the pleura that way. And there have been studies done where people have analyzed the pleural tissue and have shown that asbestos does indeed get to that location.
Q. So it either moves actually through the lung tissue to get out there, or goes through the lymphatic system and it's cleared out to the lining of the lung?
A. Yes.
Q. Okay. And then once it's there, how does asbestos fibers cause disease?
A. Once it's there is that the basic idea is that asbestos, with respect to certain types of cells in the lungs, most important of which are the mesothelial cells, is that you have a cell here -- let's say these are one of these mesothelial cells that are lining the lung, and you have the asbestos fibers, and it's been shown that the asbestos fibers can actually, directly, penetrate these cells.

And asbestos is a carcinogen, which means that it has the ability to cause cancer. And the way that it does that is not entirely understood, but we know from other carcinogens, such as a carcinogen in cigarette smoke, that these agents act upon the nucleus of the cell. And the nucleus of the cell is where the DNA, the deoxyribonucleic acid, and that's the substance that is one of the major components of your chromosomes.
And it's this DNA here that forms your genes. And these asbestos fibers act on this DNA and cause changes in the DNA that then make one of these normal cells change from a normal cell into a malignant cell, and that's sometimes referred to as malignant transformation.
Q. So the DNA is like the brains of the cell?
A. The DNA is the brains of the cell, and it's the nucleus. And there's a little thing in there that's RNA, called ribonucleic acid, and this DNA actually codes for various proteins that it makes the cells produce, and the RNA actually copies the DNA, and then it moves out into this part of the cell here which is called cytoplasm, and goes to certain areas where proteins are made, and it tells the cell what type of proteins it wants it to make.
And when asbestos or some other carcinogen comes in

here, it actually fouls this whole mechanism up, and it actually causes changes in this DNA. And eventually, over a period of time -- and we don't know exactly how long this is -- these cells can, in some instances, change from normal, benign cells into malignant cells.

And once they have changed into malignant cells, they can and, in some instances, start to grow, and eventually form a tumor that will become clinically evident.

Q. And that process can take years?

A. Can take years, yes. And we don't know much about mesothelioma, because it's something that's very hard to see initially by radiographs, but say, for example, in lung cancer if you had a nodule in your lung like this, there have been studies done looking at the change of the size of this tumor over a period of time. And people have computed what's referred to as a doubling time, how long the tumor takes to double. And by doing that and then extrapolating backwards, you can actually sometimes calculate when this tumor actually began.

And there's some studies that show that tumors that initially present in people have probably been there for maybe 10, 15, 20 years.

Q. With mesothelioma, if a person has a mesothelioma that's totally encasing their lungs, how likely is it that that's been there for a long time?

A. Well, it certainly can, and that's what's really hard to know. We don't know much about the growth rates of mesothelioma, but if you assume that, say, it's analogous to lung cancer, it probably has been there for many years. And the process of carcinogenesis or the process by which a cell becomes malignant is thought to be a process that occurs over a period of years.

And there are injuries to the cells, there's repair of

the cells, and this kind of goes on back and forth. And in some instances, the injury wins out, and the cells become malignant.

THE COURT: I think I better interrupt to take the morning recess.

MS. CHABER: Yes.

THE COURT: We will take a recess at this time until 10:45. Ladies and gentlemen, please keep in mind the fact that you are not to discuss the case either amongst yourself or anyone else. If anyone attempts to discuss the case with you, please advise the Court of that. Please return at 10:45.

(Recess taken.)

(In chambers outside the presence of the jury.)

MR. OHLEMEYER: Your Honor, Ms. Chaber's indicated that she intends to show certain exhibits to this witness

and have him, I assume, opine as to what is depicted in those photographs. This doctor is a pathologist. He was presented to us under 2034, in Counsel's declaration, as a pathologist.

He was deposed. He has created two reports in this case, and at no point in the reports -- and, in fact, in his deposition -- he disclaimed an inclination or a background and experience in analyzing asbestos and identifying asbestos in air samples or water samples, or whatever else is there.

So I think -- there are a lot of evidentiary and procedural objections to this witness trying to take these

photographs, which no foundation has yet been laid as to what they are, how they were taken, where they were taken, and then to have this man, who is either not qualified to opine as to what they are or has not been presented to us as an expert, who will testify on that subject matter, I think is improper and prejudicial, and violates both the civil code -- violates the civil code provision relating to expert declarations and expert declarations.

MS. CHABER: I think it's well within his expertise and within the disclosure of his expertise. He looks through the electron microscope all the time and sees asbestos fibers, and he's got pictures in his own book on that he's had to review, and he had it other people's work with respect to that.

And I'm going to ask him a series of questions on that foundation and then ask him what these pictures appear to depict to him, and he's going to give his opinion with respect to that. I think it's an opinion well within the disclosure and well within the expertise.

These are photomicrographs. He himself takes photomicrographs through the electron microscope. The depiction of asbestos through the electron microscope has a particular characteristic look, and these photomicrographs are the ones from the Fulham Laboratories.

The Court's already evaluated the foundational testimony from Douglas Hallgren, which the defense attempted to preclude. These are the photomicrographs that he can testify about.

THE COURT: In the first place, don't you have to identify the photographs and lay a foundation as to their authenticity, how they were taken, or something of that sort, by whoever did it?

MS. CHABER: Yes, but the problem is that witness isn't coming until next week.

THE COURT: I know.

MS. CHABER: I'm not asking for these to go into evidence at this time, Your Honor, but I certainly think that they can be marked for identification and this witness can be asked questions about his opinions on them without showing them to the jury.

When the other witness comes --
MR. OHLEMEYER: These photographs have --
MS. CHABER: I'll cover that up.
MR. OHLEMEYER: This is something more than just a picture of asbestos. This man is a pathologist. He doesn't look at air samples and look at minerals through a microscope.
MS. CHABER: He looks at asbestos fibers.
MR. BRAKE: Your Honor, he doesn't -- let me read the transcript. He was produced as a pathologist. He was asked about his use of the electron microscope, and in this deposition -- Ms. Chaber can come look if she wants.
"In your job, you're often looking for asbestos fibers or asbestos products?" Dr. Hammar said: "In this case in my job, I hardly ever use an electron microscope for that. That's done for Dr. Dodson down in Texas. What I do is I

look for basically two things, mainly biopsies and tumors."
He goes on to talk about the tumors. So having been told: I don't bother with asbestos, he wasn't asked any more questions, and it's unfair now to bring him in to give an opinion that's one type of asbestos versus another.
MS. CHABER: You've taken something out of context. That does not mean he can't identify the asbestos by looking under the electron microscope. Those are two entirely different questions.
MR. BRAKE: We came and asked him: Do you look for asbestos? No.
MS. CHABER: My objection, Your Honor, is if I had Mr. Hallgren in here today prior to Dr. Hammar's testimony and the foundation were laid for these pictures, I would be able to show this witness these pictures and ask him what, in his opinion, they are, having laid a proper foundation for him being able to have that opinion and obviously, that's an issue. If I don't lay that foundation, we don't get any further than that. I'm asking to do that in advance of the witness.
MR. OHLEMEYER: Excuse me, Your Honor. The basis of my objection is 2034 of the Code of Civil Procedure. This man was not presented for a meaningful deposition on this subject. In fact, he told me I didn't need to ask him anymore questions about that subject.
MR. BRAKE: You have to present someone for a certain specified basis.
MS. CHABER: That is not --

MR. BRAKE: That is precisely the law. You can't sandbag us on the guy's opinion. If he's going to talk about crocidolite asbestos in certain microphotographs, and do you use the electron microscope to look for asbestos and he says no at his deposition, and then to bring him in and give that opinion seems to me improper, violates the plain language of that rule.

MS. CHABER: You took something out of context. I didn't preclude that. This is not something that --
MR. BRAKE: We've stated our grounds.
MS. CHABER: I believe the disclosure was sufficient.
THE COURT: Well, if you lay the groundwork, you can raise the objection. If he answers the questions differently than he did at his deposition, that's all I can say. I know you've showed me a couple of questions and I don't know the totality of it all, and think if she lays the background you've raised an objection to, that it wasn't disclosed or the appropriate questions weren't asked with respect to that in the deposition --
MR. OHLEMEYER: But that's patent right now, and to make me object to that in front of the jury on a subject matter that he was not disclosed in his declaration to testify about, that he disclaimed --
THE COURT: I don't know what the question is she's going to ask specifically.
MR. OHLEMEYER: She's going to say: Is that asbestos, and he's going to say: Yes, it is, even though we don't know how that photograph was taken, where it was taken, when

it was taken, and this man has never been offered to us as an expert on the identification of asbestos in photographs.
MR. BRAKE: But, in fact, disclaimed that he looked for asbestos.
MS. CHABER: He didn't disclaim that. That's a different question, Counsel.
THE COURT: What question are you going to ask him?
MS. CHABER: Can he identify asbestos from looking at a picture of it. Does he know what the --
THE COURT: Was that asked there?
MS. CHABER: That wasn't asked.
THE COURT: What was what's the question that was asked?
MR. BRAKE: "In your job, you're often looking for asbestos fibers or asbestos bodies?
"No, in my job I hardly ever use an electron microscope for that. Dr. Dodson" --
THE COURT: That says electron microscope, he hardly ever does it. That doesn't mean he can't do it.
MR. SCHOLL: Your Honor, what he mentioned in that declaration, in my view, is not controlling. We have the disclosure what this expert is disclosed to testify on. That's supposed to be controlling. I suggest Your Honor read it. You won't find anything about electron microscopy or his ability to identify minerals, or so forth.
THE COURT: Well, it doesn't say that he can't identify it. It says he may testify to the pathology, he may testify to the nature of asbestos and

asbestos-containing materials.
MR. OHLEMEYER: Which he's done, the nature of it, to get into the lungs and cause disease.
THE COURT: I assume that he knows what it looks like

from his background.
MR. BRAKE: Thank you, Your Honor.
(In open court in the presence of the jury.)
THE COURT: Everybody is present except the clerk, and we are ready to resume. So please, go ahead.
MS. CHABER: Thank you, Your Honor.
Q. Dr. Hammar, does the body have any defenses against a substance like asbestos?
A. Yes.
Q. And what is that?
A. A couple of major defenses. One would be that your trachea, your main bronchi, and down to the level of what the bronchial is lined by a type of tissue that is referred to by respiratory epithelium, that is also called pseudostratified ciliated columnar epithelium.
And that tissue, very briefly, you have these cells that line these air tubes, and there are two main types of cells here. There's one that have these little cilia. Cilia are finger-like projections that come off some of these cells that have the ability to actually move, and they beat, and the way they beat is up towards your throat.
And then there are these other cells here that are called mucus cells and glomus that is producing mucus that is secreted out onto the surface of this lining. And there

are some glands here that are called mucus glands that have have these little ducts that secret mucus onto the surface here.
And as a result of this, your entire tracheal bronchial tree is lined by this epithelial type of tissue that has this mucus and a watery substance on it. So when you breathe in a dust, some of your dust will actually be collected in your nose and your mouth, again by the mucus that is present there. And also, as you breathe dust in, much of it is actually adhered to on this surface here.
And then these cilia have the ability to beat, and they propel material from the lower part of the lung up into the upper part of the lung, where eventually, it's into your mouth and you can swallow it or spit it out. So that's one defense mechanism. And many of the fibers or dust that we breathe are actually collected on that, and we never get the dust down into the outer part of our lung.
The other defense mechanism is called a macrophage, and a macrophage is a type of cell that initially is made in the bone marrow, and it circulates in the blood for a few days and then it goes into the tissue, and these macrophages have the ability to engulf things. And the things that they engulf would be things like bacteria, viruses, and any type of foreign particulate material. And they do have the

ability to engulf asbestos fibers or other dust.
And in the case of asbestos fibers, they actually can take these fibers inside the cell, and they can coat them with iron and protein. And these asbestos fibers can be

transformed into what's called an asbestos body, which is an asbestos fiber that has these nodules of protein and iron on the surface there.
And it's thought that by doing this, that those fibers are no longer dangerous. There's a great debate about that at the present time because there's some evidence that the electrostatic charge in these fibers may actually be injurious. But that's another defense mechanism.
And then once a cancer is formed, say, due to asbestos, your body does have immune cells that can potentially fight against the cancer.
Q. Okay. And if a person, for some reason, isn't inhaling the substance through their nose, but rather only through their mouth, would they lose some of the defense mechanisms that they had to get rid of dust?
A. They would. And if you breathe that just through your mouth, there's a lot of hairs and things in your nose and this sticky, gooey, mucus substance, and if they just breathe it right through their mouth, they would bypass that.
Q. Now, does cigarette smoking cause mesothelioma?
A. No.
Q. Does cigarette smoking affect the defense mechanisms of the body?
A. It does.
Q. And how does it do that?
A. A couple of different ways. Cigarette smoke has all kinds of things in it. I think there's several thousand

different compounds in cigarette smoke. The way it can affect the body's defense mechanisms is it can transform this lining of the trachea and the bronchi, that's normal ciliated, into a type of epithelium that's called squamous.
Q. What does that mean?
A. That means that instead of the epithelium being composed of these cells that have this cilia on them, it can change into a layer of cells that looks like this, and actually would be the type of epithelium that actually forms the surface of your skin. This is squamous epithelium.
Q. So it no longer has the little hair-like, finger-like substances --
A. Right.
Q. -- that push fibers such as asbestos up out through your mouth?
A. That's right. And that's a process that's referred to as squamous metaplasia. And metaplasia means that the epithelial tissue changes from one mature type into

another
19 mature type.
20 The other thing that cigarette smoke does is there's
21 many articles that it damages your immune system, and
22 without getting into a lot of detail, is that it actually
23 affects your lymphocytes, causes a decrease in certain
types
24 of lymphocytes.
25 Then the other factor is that the particulate matter
26 in cigarette smoke is actually breathed -- actually gets
27 into your lungs. And the particulate matter is a part of
28 the tobacco. It's part of whatever else is in the

1 cigarette. And this particulate matter can get into your
2 lungs, and most of this particulate matter is engulfed by
3 these macrophages.
4 Q. How do you know that it can get into the lung?
5 A. It's been shown, because there is a substance that is
6 on the tobacco leaf that's actually part of the soil where
7 the tobacco is grown, and it's called aluminum silicate.
8 It's a very tiny crystal, and you can see that with the
9 electron microscope.
10 And I have some pictures in there that are referred
to
11 as smoker's macrophages. Smoker's macrophages are these
12 macrophage cells that do all different kinds of things,
good
13 things and bad things. But one thing they do is they
engulf
14 all this particulate matter. And if you were a smoker,
you
15 would have many, many more, several million more of these
16 macrophages in your lung than if you were a nonsmoker.
17 And the way you can tell if they are particulate,
that
18 they are smoker's material, is that because of this
aluminum
19 silicate crystals. And if you were ever to analyze
exactly
20 what the material is, you could prove that it was from
21 tobacco smoke. So that's the body's defense mechanism
also
22 against tobacco smoke.
23 But one thing that tobacco smoke does --
24 MR. BRAKE: Your Honor, I wonder if we could have
25 another question?
26 THE COURT: That's reasonable, yes.
27 MS. CHABER: Q. Okay. Does the tobacco smoke in
any
28 way affect the lung's ability to retain, or for the
asbestos

1 to get into the lung?
2 A. It's been shown --
3 MR. BRAKE: Your Honor, I'd like to lodge an
4 objection. This line of questioning began with a question:
5 Does cigarette smoking cause mesothelioma, which, as I
6 understand it, is an issue in the case, mesothelioma. The
7 answer was no.
8 MS. CHABER: Your Honor, if we are going to have
9 speeches, could we have a sidebar?

MR. BRAKE: I object to the relevance of tobacco questions.
THE COURT: What's the relevance?
MS. CHABER: The relevance is that the cigarette smoke affects the way asbestos is able to get into the lungs, and it's relating specifically to the ability of the asbestos. It happens to be facilitated by the cigarette smoking, and I cannot separate those two.
THE COURT: Let's ask that question, then.
MS. CHABER: Q. Doctor, does cigarette smoking facilitate the ability of asbestos to get into the lungs?
A. Yes, two ways. Number one, it causes the squamous metaplasia so that those cells are not able to actually eliminate the asbestos as well. And number two, it inhibits the clearance of asbestos from the lungs, and it actually causes an increased concentration of asbestos in the lungs and in the airways, and in the latest article that was just published this past month by Dr. Andrew Churg.
Q. But it's not the cigarette smoking in and of itself

that would cause mesothelioma?
A. It doesn't. And one might actually think that cigarette smoke would be important in mesothelioma, and I've often thought about this myself, that if cigarette smoke does result in an increased concentration of asbestos in the lung, then why wouldn't there be an increased incidence of mesothelioma in cigarette smokers? And I don't know the answer to that question.
There isn't, but there's no doubt that it's been shown in animals and humans that cigarette smokers do have increased concentrations of asbestos in their lung versus nonsmokers, but there doesn't seem to be any apparent increased incidence of mesothelioma in smokers versus nonsmokers who have the same level of exposure to asbestos.
Q. Can you describe the size of asbestos fibers that are able to be inhaled?
A. The fibers that are inhaled are basically less than a half a micrometer long -- I mean wide. A micrometer is 1/100,000ths of a meter. A meter is about a yard long, so a very, very narrow substance. And the actual length can vary from as short as, say, a half a micrometer in diameter up to some that are -- the longest that I've seen myself has been like about 300 micrometers in diameter.
Q. You've actually seen asbestos fibers -- can you see them with the naked eye?
A. No, you can never see them with the naked eye. Where

I have seen them is actually on filter preparations that I have made from digested lung tissue when we are doing

asbestos body counts. The asbestos fibers are almost transparent or slightly yellow-white structures that are -- you would never or hardly ever see them in a tissue section of lung tissue that has been stained with the ordinary stains that we use.

But when I do these digestion techniques to try to analyze the lung tissue for the amount of asbestos in it, they are deposited on the milliport (phonetic) filters that we use, and you can see them as very long -- not necessarily very long, varying lengths with very thin, smooth, almost transparent structures.

Q. Okay. And is looking at asbestos fibers through a microscope something that you do as part of your job?

A. Yes, I do these digestion studies all the time and count, primarily, the asbestos bodies. There's some people that don't form asbestos bodies very well, and then I will indicate in reports that I do that the fiber burden is greater than the asbestos body burden.

Q. Okay. Let's talk about that for a minute. What do you mean by "fiber burden"?

A. Well, when a person has been exposed to asbestos, they breathe it into their lungs, and it's deposited in their lungs. One type of asbestos is called chrysotile asbestos, which is a --

Q. Let's put the different types of asbestos up there as we relay this.

A. There are two main classifications of asbestos. One is referred to as the serpentine asbestos, and one is

referred to as the amphibole asbestos. And there are three major commercial types or three types of asbestos that have been used extensively commercially.

The one that's been used the most common commercially is chrysotile asbestos, which is also referred to as white asbestos. And this type of asbestos is actually found here in California, at one time was even mined in California, and is a type of fiber that, at least in a gross form when you see these asbestos rocks, can be a curved fiber, and that's why it's called serpentine, snake-like curve. And the thing about this is when you look at it by electron microscope, this fiber is hollow. It actually has a hollow.

Core. The other major type is these amphiboles, and they are different, in that they are solid fibers. There are two main types. One is called crocidolite.

Q. And that was the kind you described in Australia in that town where they were doing mining?

A. Mine about a thousand miles north of Perth. That's been mined also in South Africa in the Cape province. That's blue asbestos.

And the other one is amosite asbestos. That's also referred to as brown asbestos.

Q. And these color designations --
A. Color designation actually refer to the color of the gross rock as it appears. And the crocidolite does have a blue tint to it.
Q. And you drew some straight lines.
A. Yes, these are the straight fibers. When chrysotile

is very short, as it often is when it's breathed into the lung, it also is a straight fiber, as well, but these are solid.

If you look at these in cross-section, you have a solid. You may not have this center here. And there's a difference in the chemical components of the different types of asbestos. For example, chrysotile has a high magnesium component. And amosite and crocidolite have a high content of iron.

Q. Okay. And these different fibers, when you do a fiber burden analysis, do you ever look to see what the different types of fibers there are?
A. Yes, there are instances where that is important to do, and that's been done extensively, and it's done by a couple of different techniques. It can be done with either a scanning electron microscope or a transmission electron microscope.

And there's one technique that's used called energy dispersive x-ray analysis. And the other type of technique that's used to identify the specific fibers is referred to as x-ray defraction. And I won't go into the way that's done, but basically, you have the ability to determine the individual elements that make up these fibers. And by identifying those individual elements, you can determine what type of fiber is present.
Q. Okay. And how do you do a fiber burden analysis? What do you need in order to do that?
A. You need -- you could do it, theoretically, on any

type of thing that you wanted to. Whether you'd find anything is a whole other story. When it comes to lung tissue and asbestos-related diseases, you basically do it on the lung tissue or, as we are doing now, on pleural tissue or lymph node.

And what you would do is take a sample of this tissue and you would digest it, or you would make it into a situation in which the organic material, like the lung tissue, the blood vessels, and everything like that, has been digested away, and all you have is the inorganic material or something that's not digestible, and what you digested it in.

And the most common material that is used to digest tissue is bleach. And bleach, Clorox, Purex, whatever has a chemical in it called sodium hypochlorite, and this sodium hypochlorite digests the tissue, and when you digest it, you're left at the bottom of the container in which you digest the tissue this sediment. And it's in that

sediment
19 that the asbestos is present.
20 And there are ways to extract that sediment and pass
21 it through what's called a milliport filter or a nuclear
22 port filter that are made of certain substances that have
a
23 very distinct port size, and the asbestos fibers and the
24 asbestos bodies get caught in that filter.
25 And then you can either look at it with a light
26 microscope and count asbestos bodies, or you can use an
27 electron microscope and you can analyze for the asbestos
28 fibers. You can count the fibers, and then you can do the

1 energy dispersive x-ray analysis and the x-ray defraction
to
2 tell what the fibers are and to see if they are asbestos
3 and, if they are asbestos, what type of asbestos they are.
4 Q. Okay. And if you have a living patient and you have
5 only a small amount of tumor tissue, is that likely to
yield
6 results about what the fiber burden is?
7 A. No, nobody really knows much about if there even is
8 asbestos in a tumor. That's been reported one or two
times,
9 but no studies have been done looking only at the tumor, so
10 if you just had the tumor, in general, you would not do a
11 fiber analysis on that tissue because you wouldn't know
12 whether you would find anything, in the first place, and
13 even if you did find anything, you wouldn't know what that
14 meant. So it would not be the type of specimen you would
15 analyze. What you would generally analyze would be lung
16 tissue.
17 Q. And in those instances, either somebody's had
surgical
18 removal of a portion of their lung or it's after someone
has
19 died?
20 A. Right. Some people with mesothelioma are treated
with
21 radical surgery, called extra pleural pneumonectomy, in
22 which they take out the entire lung and pleura. And in
that
23 type of specimen, you would have lung tissue available to
do
24 these digestion techniques. In most people that are
25 diagnosed with mesothelioma, you often do not have any
lung
26 tissue to analyze.
27 Q. Do the size of the asbestos fibers make a difference
28 with respect to causing mesothelioma?

1 A. Maybe. A very difficult question to answer at the
2 present time. There is a hypothesis that's referred to as
3 the Stanton hypothesis and the Pott, P-o-t-t, hypothesis
4 that indicates that it's physical characteristics of
5 asbestos rather than their chemical characteristics that
are
6 responsible for causing mesothelioma.
7 And the basic idea here is that you have to have a
8 fiber at least either five micrometers long or eight
9 micrometers long and less than 0.25 micrometers in diameter

to be able to cause mesothelioma.
Now, that's being challenged at the present time, and
I don't know if the final conclusion is in yet with respect
to whether they are short fibers. Especially short
chrysotile fibers can cause mesothelioma, and I just don't
think we can say one way or the other at this point in time.
What has been stated in this Pott hypothesis and the Stanton
hypothesis is that it's the long amphibole fibers that are
most frequently the cause of mesothelioma.
However, in the last couple of years, there's been
more and more cases of chrysotile-induced mesotheliomas
being recorded, which maybe casts some doubt on that, or
maybe shows that all types of asbestos can cause
mesothelioma under the right circumstances.
Q. Okay. And one of the theories on why the chrysotile
would be able to do that with short fibers is that because
that's when the chrysotile curly fiber gets to be like a
straight fiber like the amphiboles?
MR. BRAKE: Objection; leading, Your Honor.

THE COURT: Don't lead the witness.
MS. CHABER: I was trying to understand what I thought
he said.
Q. What's the theory on the short chrysotile fibers?
A. Experimental theory in animals goes like this: That
if you have the pleural surface right here and you have the
lining of the pleural surface by these mesothelial cells,
there are these structures here, and these actually connect
with lymphatics in the pleura, and these are called lacuna.
And these lacuna have certain dimensions. And what's
been shown experimentally is the short fibers actually seem
to be able to get into these lacuna and actually drain into
the lymphatics and go elsewhere, but the longer fibers
actually get caught in these and actually get lodged there
and initiate this inflammatory reaction that then may go on
to develop mesothelioma. And that's why, experimentally,
it's thought that the long fibers cause mesothelioma and the
short fibers don't.
But the problem with that is that when people -- when
people have analyzed the pleural tissue for asbestos, the
dominant fiber in the pleura is chrysotile, and that doesn't
mean that crocidolite and amosite are not there. They
certainly are and have been identified.
So this area is in a statement of flux at the present
time, and we don't totally understand if chrysotile can
cause mesothelioma to any certain significant degree, are
the amphiboles always more frequently the cause of
mesothelioma, or exactly what. We are still trying to study

that.
Q. And in the United States, what are the relative percentages of use of chrysotile and crocidolite and amosite?
MR. OHLEMEYER: Objection, Your Honor. Lack of foundation.
THE COURT: Lay the foundation.
MS. CHABER: Q. Is that an issue, Doctor, that you've looked at in order to understand what you're looking at with respect to fiber burdens?
A. Yes.
Q. And what are the relative percentage of use of the three different main commercial types of asbestos?
MR. OHLEMEYER: Same objection, Your Honor.
THE COURT: Overruled.
THE WITNESS: 95 percent of all the asbestos that's been used in the United States has been chrysotile, and when you actually -- when you look at people's lung tissue who have mesothelioma, the most common fiber you find is amosite, and the least common that you find is crocidolite.
MS. CHABER: Q. In the United States?
A. In the United States.
If you were to take Australia or South Africa, it would be the exact opposite of that. And there are records kept, records that have been published with respect to how much various asbestos has been imported into the United States, and the most common is chrysotile and amosite. Crocidolite has been used in the United States, but not as

frequent.
Q. Okay. And when you have done, or have you done analysis of people's lung tissue to see which of the different types are in the lung tissue?
A. I have.
Q. And how frequently have you found crocidolite asbestos when you've looked for fiber types?
A. Infrequent. In the 50 cases that Dr. Dodson and I have just completed analyzing of people who had mesothelioma who lived in the northwest of the United States, only two of the 50 had any crocidolite in their lung tissue.
Q. And do you know what the sources of the crocidolite was in those two?
A. In one person, I think the source was transite pipe, which contains crocidolite asbestos in the cement. And the other person was one of the cases that was not from the northwest, was actually from Louisiana, a person that had worked in the oil refineries, and I'm not sure exactly what the source was.
Q. Okay. But in your experience, it's relatively infrequent that you find crocidolite in the lung tissue?
MR. BRAKE: Leading, Your Honor.
THE COURT: Don't lead or suggest the answer.

MS. CHABER: Q. Based on your experience, how common is it to find crocidolite?
A. Uncommon. And that's also been published by Dr. Victor Roggli, and in the Journal of Industrial Medicine in 1993, when they analyzed the contents of 94 cases of

malignant mesothelioma in United States, and the major type they found was amosite. The ones that were the least frequent was crocidolite and chrysotile.
Q. Can you explain what the concept of latency is with respect to asbestos causing disease?
A. Sure. Latency has a very simple definition. The concept, though, is probably more difficult to understand with respect to why there is latency or what it means.
And the latency, by definition, is the time period between first exposure to asbestos and the development of the disease. And all of the asbestos-related diseases have a latency period.
And in the case of mesothelioma, you can actually graph it something like this, that if you had the time on the X axis, we will just put -- this would be zero years, this would be 60 years, and this is the number of cases of mesothelioma on the Y axis.
The shortest latency period that I have personally seen myself in the cases that I reviewed has been ten years, and that means that the person was exposed to asbestos ten years before they developed the Is disease; at least clinically came down with the disease of its diagnosis. The longest I've seen is 62 years. The shortest latency I've seen reported in the medical literature is five years of mesothelioma.
So basically, what you do is have a graph, and about the most common or the most frequent latency would be in the neighborhood of about 30 to 35 years. So you would have a

graph that would look something like this.
And part of this down-shaped curve right here actually is not necessarily that there are few latencies at that time, but a lot of people have already died and died from other causes.
But the most common latency for mesothelioma would be in the 20 to 40 year range, and the most frequent, from my own experience, is between 30 to 35 years, and that means that the person was exposed to asbestos 30 to 35 years before they were diagnosed with developing the disease or diagnosed with the disease.
Q. And where does a 42-year latency period fall?
A. That, again, would be in that time period. That was probably about the most common. That would be -- I've seen many, many cases in the 40- to 50-year period. So anything in that area would be fine.
And why one person would have one latency period and

another person another is just not known. I think the people who have been reported to have this very short latency had very high exposure, but the one case that I saw that had a latency of ten years had what I would say was a mild exposure to asbestos.

Q. Is there any known quantity of asbestos that a person has to inhale to cause mesothelioma?

A. We know that all of the asbestos-related diseases, including mesothelioma, are dose-related.

Q. What does that mean?

A. That means that the more asbestos you're exposed to,

the greater your risk of developing an asbestos-related disease, and the higher the incidence is of the disease than in the person who has been exposed the most.

And that can be looked at, from my point of view as a pathologist, of concentration of asbestos in the lung tissue. The greater the concentration of asbestos in the lung and pleural tissue, the higher your chances of having one of these asbestos-related diseases.

Now, exactly how much it takes is another question. We know, for example, that it takes more asbestos to cause lung cancer and asbestosis -- asbestosis is scarring of the lungs caused by asbestos -- than it takes to cause mesothelioma.

What we don't know is what is the minimal amount of asbestos it takes to cause, say, mesothelioma and hyaline pleural plaques. And the reason we don't know that is because there are many cases of mesothelioma that have been recorded in which there are low concentrations of asbestos in the lung tissue, and a couple of case reports in which people have claimed to have been exposed occupationally or bystander-type setting in which the concentration of asbestos in the lung has been win what is considered the normal range of a person who was never exposed.

Q. What do you mean, the normal range of someone who was never exposed?

A. I mean that if you were to take most people in an industrial setting, there would be a significant chance that you would find some asbestos in their lungs.

And in Kitsap County in the state of Washington, I've done this on people who have been accident victims or people who have died from heart disease or who have never been exposed to asbestos.

In our laboratory in Bremerton, for example, we find up to 20 asbestos bodies per gram of wet lung tissue, which is about the size of a sugar cube, in some people who have no history of any type of exposure to asbestos. So that means that somehow, those people were exposed, and this could have been some way that they didn't know, but that is what's been found.

And in the California area down here in San Francisco, Dr. Churg and Dr. Warnog, who's a pathologist at the University of California San Francisco, published that normals in this area were zero to a hundred asbestos bodies per gram of wet lung tissue. And a normal person, so to speak, a person who is not exposed to asbestos could have this concentration of asbestos in their lung tissue.

So the question is, is that material that many of us have in there, is that harmless or does it cause any disease? And I would say in general, it's probably harmless and doesn't cause any disease, but what is the lowest level of an increase in asbestos in lung tissue that causes mesothelioma is really not known.

All we know is that in some individuals it does seem to happen at a very low concentration. And by low concentration, I mean only a few times greater than background concentrations.

Q. And do individuals respond the same to a substance like asbestos?

A. They probably don't, but this is an area, also, that's undergoing evaluation. In 1989, I published an article in a journal called Human Pathology called "Familial Mesothelioma," and we described three brothers there who were asbestos insulators who all developed mesothelioma, and another father and son who developed mesothelioma. The son did not have elevated concentrations of asbestos in his lung, although his father worked at a shipyard.

And there has been an implication that maybe genetic factors are involved in the development of mesothelioma, namely that maybe some of us, because of our genetic make up, may be more susceptible to certain bad effects of carcinogens than other people, and there's a great deal of research going on in this area right now.

That paper that I just reviewed for Cancer had to do exactly with that, specifically looking to see if there are more cases of cancer in first-degree relatives of people who had mesothelioma.

And most of the findings have been inconclusive. There's a suggestion that maybe there is a genetic factor, but it hasn't been proven for certain at the present time.

Q. Okay. And it would be a genetic factor response to a carcinogen?

A. Yes. And what it might actually deal with specifically is not really a genetic factor, exactly, with the carcinogen per se, but really how one's genes determine

what enzyme systems they have, maybe, in their body to detoxify things.

And there's really some needed research going on now

with an enzyme system called glutathione. And there's been papers on people who don't have this enzyme have a higher incidence of lung cancer and asbestosis than people who do have this enzyme, and suggesting that the people who have the enzyme, who have the gene for this one enzyme are able to detoxify the asbestos, and the people who don't have it are not able to detoxify the asbestos.

Q. And that's ongoing research that's going on now?

A. Yes.

Q. But there's no answers at this point in time?

A. No answers at this point. The genetics theory in almost all kinds of lung cancer has been implicated, but never proven, I guess, with the exception of breast cancer.

Breast cancer in women, for example, if you have a mother, aunt, or whatever, you have a much higher incidence of developing breast cancer than if your mother or aunt does not have breast cancer.

Q. And is there a concept as it relates to asbestos that deals with the accumulation of asbestos fibers?

A. Yes.

Q. And what is that?

A. That you can look at that just accumulation of asbestos fibers in the lung tissue and what the fiber burden is that gets in the lung tissue.

Q. Is it thought that --

MR. BRAKE: I can already tell this one is going to put words in the witness' mouth, so I'll object as leading.

THE COURT: It sounds like it's going to be leading. I don't know whether it will be or not. Don't let it be.

MS. CHABER: Q. Is there a concept that asbestos diseases are cumulative?

A. Yes.

Q. And what does that mean?

A. That has to go back with the dose-response relationship, which means that the more asbestos that you get in your lungs, the greater your risk, the greater the incidence is of asbestos-related diseases.

The amphibole asbestos specifically are not cleared to any significant degree from the lung tissue. Some of them do go to the pleura, some of them do go to the lymph nodes.

So the more that you are exposed to and the more asbestos that you breathe into your lungs and the more the fiber burden in the lungs, the greater the incidence is of the asbestos-related diseases, including mesothelioma, asbestosis, pleural disease, et cetera.

Q. And with respect to crocidolite, how does the lung do on clearing crocidolite fibers?

A. Crocidolite is an amphibole asbestos. It is one that is similar to amosite, and it is not cleared to any significant degree. The clearance that I have read in papers that have been published have been about 20 percent of the amphibole asbestos is cleared from the lung. The rest of the amphibole asbestos, amosite and crocidolite,

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stays in the lung tissue where it's usually cleared to the pleura and to the lymph nodes.
Q. So it's not being cleared out of the system, but cleared to other parts?
A. Cleared to other parts, yes.
MR. OHLEMEYER: Objection.
THE COURT: That's all right. Overruled.
MS. CHABER: Q. And the chrysotile, does chrysotile have the same type of clearance that crocidolite and amosite do?
A. No, chrysotile is relatively rapidly broken down in the lung. In a matter of three to four weeks, most of it is broken down and removed from the lung. And it is cleared also to the lymph nodes and to the pleura, and it can get occasionally to other parts of the body, as can the amphiboles.
Q. You spend a fair amount of your time looking through a microscope; correct?
A. I do, yes.
Q. Can you tell us, as a pathologist, what you look for to diagnose a mesothelioma?
A. Sure. Mesotheliomas have certain features that are characteristic, depending at what level you look at them. At the autopsy level, what you'd look at is with your own eyes, and you would see a tumor that is surrounding the lung tissue, sometimes totally, sometimes not totally, and it would be compressing the lung.
It's usually grayish white to grayish yellow. It can

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form nodules that directly invade into the lung. The tumor usually is of variable thickness. It's usually thicker at the base of the lung, surrounding the lung than it is at the top of the lung. That's what it would look like, when you were just to look at it at autopsy with your own eyes, if you had a lung in your hands.
The tumor frequently invades into the chest wall, and it's extremely difficult to remove a mesothelioma and a lung from a person who's dead, who's died from that disease. And I say that from my own experience, having done about a hundred autopsies on people with this disease.
The next level is at the light microscopic level. And the important thing there to recognize, and I think this is why there's a mesothelioma panel, is that mesotheliomas can have a variety of different forms, and that means that the cells can be of various sizes and shapes and can form various structures. That's my responsibility, to know what they can look like. But a lot of pathologists who have not seen mesothelioma don't realize all of the different forms

that they can assume.
The most frequent form is an epithelial form of cancer, where the cells are usually rectangular and little building blocks, and they are connected to each other and usually form what are called tubular structures, where they form little tubules, or they form these papillary structures, which are little out pouchings. And that is referred to as a tubule papillary epithelial type of mesothelioma.

On the other side of the spectrum are the mesotheliomas that are derived from those spindle-shaped cells, or undergo this spindle-shaped differentiation. And those are the ones that are referred to as the sarcomatoid mesotheliomas, and those are composed of these elongated cells that often form these interlacing particles that look totally different than the epithelial mesotheliomas.

Then you have ones that are in between that, that we call transitional mesotheliomas that don't look really like the epithelial cells and don't really look like the spindle cells, but look like great big cells that are kind of irregular-shaped. And if you were to ever read that book there, which I'm sure you never will, but there's all kinds of pictures of various forms in there that these tumors can assume.

And then the next level is at the histochemical level, which I don't think we need to get into, and then the immunohistochemical level and the EM level.

Q. And the EM is what?

A. Electron microscope.

And all of those levels of diagnostic techniques have certain features that are relatively characteristic of mesothelioma, but frequently not absolutely specific.

Q. Okay. Have you looked at Dr. Horowitz's case at my request?

A. I have.

Q. And did you ever meet him yourself?

A. I did not.

Q. Did you feel that you need to, in order to render opinions about what disease he has and what caused it?

A. No. I mean, as a practicing pathologist in Bremerton, or wherever, I meet less than a tenth of one percent of the patients. I don't see the patients. I see their tissue and I know their name and their age and sex, and I often know their clinical history, but I don't often know the person, per se.

Q. What did you do with respect to reviewing Dr. Horowitz's case?

A. Three things. I looked at the slides that were prepared that were stained with the standard dyes that pathologists use, and I looked at the slides under my light

microscope and determined the appearance of the cancer cells, whether they are forming any structures.

We had five unstained slides to do some tests with, and the tests that I chose to do were the immunohistochemical tests. And we did tests for carotene, for human milk fat globule protein II, CEA, Leu M-1, and B72.3, and it turned out that the cancer cells were positive for carotene. Good portion of them showed cell membrane staining for the human milk fat globule protein II, and they were negative for the CEA, Leu M-1 and the B72.3.

And although that's not absolutely specific, that is the characteristic profile that an epithelial mesothelioma would have. And by the ordinary white microscopic appearance of the tumor that I looked at, that's what he had.

And then there was one other test that was done at the other hospital where he was at, and that was an electron microscopic evaluation of his tumor where a small piece of the tumor was saved in a special fixative and prepared in a special way so that it could be examined in an electron microscope.

And in the electron microscope you have something to look at, but the way you preserve what you look at is by taking photographs of it. And there's a camera built into the electron microscope that you expose the film and then you print that film, and that is a photograph of what you are looking at. And I reviewed the electron micrographs of his tumor.

MS. CHABER: I'd like to have a series of electron micrographs marked. I'd ask that we mark them as Exhibit 1 and, if possible, A, B.

(Plaintiffs' Exhibit 1 - 10 marked for identification.).

MS. CHABER: May I approach the witness, Your Honor?

THE COURT: Sure.

MS. CHABER: Q. Dr. Hammar, I'm handing you what's been marked on the back of each from the numbers 1 through 10, and ask you if you'd take a look at that and tell us what those exhibits represent.

A. These represent electron micrographs of the tumor. And like I said, these are photographs of the tumor that was examined in the electron microscope of the pleural tumor that was biopsied from Dr. Horowitz.

Q. And where was this done, the electron micrographs?

A. I think it was done at Cedar Sinai Hospital in Los Angeles, California. They have an EM unit there.

Q. And can you tell us the quality of the work that they did in Exhibits 1 through 10?

A. These are excellent quality. The tissue is very well preserved. The photographs are in very good focus. The detail is exquisite.

MS. CHABER: At this time I would move them into evidence.

MR. OHLEMEYER: No objection, Your Honor.
THE COURT: All right. They may be admitted.
(Plaintiffs' Exhibit 1 - 10 received in evidence.).
MS. CHABER: Q. Dr. Hammar, I realize that they are small, and I'm wondering if, with the Court's permission, if Dr. Hammar could come down here so that he can show them to the jury while he talks about them.
THE COURT: All right.
MS. CHABER: Q. Dr. Hammar -- and you don't have to talk about every one of them -- but could you show the jury, based on these electron photomicrographs, what's characteristic about the mesothelioma?
A. Yes. I will only show maybe three, which I think are adequate. These are various magnifications, and I would guess, from my own experience and using my own electron microscope, that this is a magnification of about 10,400 times, which that means that the cell has been magnified that many times.

And these are individual cells that you can see right here. Sometimes you can see what looks like almost an entire cell, sometimes you only see parts of a cell. This thing in the center that you see right here, that's the nucleus of the cell.
Q. What exhibit number are we looking at?
A. We are looking at Exhibit Number 29652.5.
Q. Exhibit 2.
A. Exhibit 2. These are the cancer cells right here. And the way you know they are cancer cells is you compare or you make sure that when you're examining something by EM, that it indeed matches up with the tumor that you looked at through the light microscope.
But these are the individual cancer cells. This is the nucleus of the cell, and that little dot that you see there in the center of these cells, that's the nucleus, and that's where the RNA is, and that's the RNA copies of the DNA to tell cytoplasm of the cell, which is this material out here, what type of protein or what type of material to make.
The thing that is fairly -- that is very characteristic of these cells can be seen in all three of these, and the most characteristic thing of mesotheliomas are these structures right here that you seen in between the cells.
And these structures arise from the cells, and those are called the microvilli. These are these things right here, and they actually arise from the cells and they are

very wavy, and they are present in normal mesothelial cells.
And what they are thought to do is actually function to increase the surface area of the cell, and specifically when

it secrets the hyaluronic acid to make the lubricant. It's able to secret a lot of that, and actually in a small cell space, because it has all of these extensive processes.

And at higher magnification, which is this right here -- and I would estimate that would be, oh, about 16,000 or 20,000, these are parts of cells right here. Again, this is the nucleus right here. The black thing in the center is the nucleolus, and you can see the microvilli that arise from the cell. And those are usually fairly long. People have actually measured the ratio of the lengths to the width, and usually they have length-width ratios greater than 15.

And then on the final photograph here, you can just --

Q. Can you give us the exhibit number?

A. The exhibit number is 9 on that one. The one before was 3. 9 you can see the same thing with the microvilli in between the cells.

The other features that are fairly common to mesotheliomas, and there's been one study published actually doing a quantitative study, are these little dark lines right there. See those dark lines? Those are called desmosomes, d-e-s-m-o-s-o-m-e-s, and desmosomes are places where the cells are physically connected to one another. And mesothelioma cancer cells have larger desmosomes than the cancer cells of a lung cancer. So these

electromicrographs show the classic appearance of an epithelial type of mesothelioma.

Q. Did you also review medical records or Dr. Horowitz?

A. I did.

Q. And did you, after reviewing all of the medical records, the slides that you reviewed, the electro --

A. Electromicrographs.

Q. I don't know why I'm having trouble with that.

-- electromicrographs, come to a conclusion as to what Dr. Horowitz is suffering from?

A. Yes. Dr. Horowitz is suffering from an epithelial mesothelioma.

And there were couple of things in his history that one had to consider. He had previous cancers diagnosed, and the way the EM rules out those other cancers -- and we also did one other immunohistochemical test that rules out, and that was a prostate specific antigen, and that's a test for prostate cancer cells, and that was negative.

So the EM findings, the immunohistochemical findings are diagnostic, are totally characteristic of an epithelial mesothelioma. And the light microscopic appearance of his cancer that involved his pleura was also characteristic of an epithelial mesothelioma.

Q. Okay. Now, you mentioned that Dr. Horowitz had had other cancers. Did you look at the materials from the

biopsies of those cancers?
A. In 1971 he had a colon cancer, and I don't think the pathology material was available for that. I did not look

at that. I did look at the information concerning that, and the critical information in that was that the tumor was fairly large, it measured up to 10 centimeters, but there was no evidence of metastases to the lymph nodes in the mesenteric adipose tissue, fat tissue.
Q. And what's the significance of their -- first of all, what's metastasis?
A. Metastasis means spread from the primary tumor site to another tumor site with no physical connection to the two sites.
Q. What's the connection of finding no metastasis in the lymph nodes?
A. That means that he has a low stage or a good stage type of colon cancer, which often is curable by surgery alone. And as far as I could tell from reading the records, there was no evidence of any recurrence of his colon cancer, which he had resected in 1971.
In 1987, he was being followed for symptoms of prostatitis, and a biopsy of the prostate gland was done in 1987. I reviewed that prostate biopsy and it showed an infiltrating prostatic adenocarcinoma that I graded as a grade three over five, according to the Gleason, G-l-e-a-s-o-n, system.
Q. And what does that mean?
A. That means that it's moderately differentiated. The tumors that are the best differentiated are the ones that most closely resemble normal tissue. The ones that are poorly differentiated are tumors that least resemble normal

tissue. His was about right in the middle.
He then had a type of surgical procedure referred to as a radical superpubic prostatectomy, in which his prostate glands with seminal vesicles and pelvic lymph nodes were resected. The prostate gland showed infiltrating, moderately differentiating adenocarcinoma that focally did extend to the capsule of the prostate, or what is called the capsule, and there one of the lymph nodes showed a metastases.
So he had a prostate cancer that I think would be what's called a stage C prostate cancer. And there was evidence that his prostate specific antigen serum test was elevated.
Q. Is that the PSA?
A. The PSA was elevated. I think it was in 1991 when that was first identified to be elevated, in December.
Q. What does that mean when it's elevated?
A. That means that there's a chance that he has recurrent

prostate cancer. And the level that he had was 13.4. And in a person who has had their prostate out, you would have zero. So that was indicative of the possibility that he had recurrent prostate cancer.

And as a result of that, he was treated with two drugs, one called Lupron, L-u-p-r-o-n, and the other called Flutamide, F-l-u-t-a-m-i-d-e. And those are two hormonal-type drugs that are used in treating prostate cancer. And when he was put on that type of treatment, his PSA, which stands for prostate specific antigen, went to

zero. And he did not have any evidence of bony metastases, or any evidence of other metastases, except for that one lymph node.

Q. And how was it determined that he didn't have evidence of spread to other organs?

A. By the radiographic studies that were done, like a bone scan. Prostate has a propensity to metastasize to bone, spread to bone as the common site of spread after it is spread to the lymph nodes, and he did not have any definite evidence of spread.

There was one study in there where they wondered about whether there was involvement of his third lumbar vertebra, but that was never totally conclusive. And as far as I know, after that period of time, there was no evidence of recurrent prostate cancer, and there was no evidence of any elevation of his PSA.

Q. Do you have an opinion, to a reasonable degree of medical certainty, as to whether or not either the colon cancer or the prostate cancer have anything to do with the mesothelioma that Dr. Horowitz has?

A. I do have an opinion, and they do not.

Q. And what do you base that on?

A. Because they are not related to the mesothelioma in any way that I know. And I am positive that the tumor that he has involving his pleura is a mesothelioma and is not a metastatic colon cancer or a metastatic prostate cancer.

MS. CHABER: Would this be a good time to take a break?

THE COURT: All right. We will take the noon recess at this time.

Ladies and gentlemen, please keep in mind the admonitions given to you before, not to form an opinion about the case, you are not to discuss the case, you are not to do anything in connection with this case, and if anyone attempts to talk to you about it, please advise the Court of that fact. Return at 1:30, please.

(Lunch recess taken)

THE COURT: We are now all present, including not only

the witness, but all the jurors and all counsel.
MS. CHABER: Q. Dr. Hammar, before we broke for lunch, you had told us that it was your opinion that Dr. Horowitz has mesothelioma.
A. Yes.
Q. And in your opinion, what caused his mesothelioma?
A. Asbestos.
Q. And what do you base that on?
A. Based on the clinical history that I had read concerning where he was exposed to asbestos.
Q. And what would be the sources of his asbestos exposure?
A. He had potentially -- I think there were five different sources that were listed. One was the asbestos present in Kent cigarettes that he smoked for about four years. Another was a building that was being built when he was in Chicago that was -- not Chicago -- anyway, a building that was --

Q. Cleveland?
A. Cleveland, Ohio, where he was being -- was working, a building was being built, which he stated was close to his office that was being sprayed with some type of insulation that he thought may have contained asbestos.
A third place was when he was in Los Angeles and another building was being built, a child center, and again, the same situation where asbestos may have been used on that building, some type of insulation or spraying of some type of steel girders, or whatever.
And then there was also a time, I think again when it was Los Angeles, when he was replacing the tile in his basement, and he was concerned that possibly the tile may have had asbestos in it.
Q. And of those potential sources of asbestos, what do you believe are the most likely contributing causes to his mesothelioma?
A. Without knowing anything else, I would say that the asbestos in the Kent cigarettes were the most important thing, at least as far as I understand what has been published concerning that issue at present time.
Q. What is --
A. That that is an article --
MR. OHLEMEYER: Objection, Your Honor. It's hearsay.
THE COURT: Sustained.
MS. CHABER: Q. What is the basis for your opinion that the Kent cigarettes were the most likely source of the asbestos that caused Dr. Horowitz's mesothelioma?

A. There's documentation that the Kent cigarette filter contained crocidolite asbestos in a time period from 1952 to the latter part of 1956.
Q. And have you, in reaching your conclusion, have you reviewed certain articles and materials from a Dr. Longo?

A. I have.
Q. And have you reviewed any publications in the scientific literature?
A. I have.
Q. And what have you reviewed?
A. I have reviewed a paper that was published by Dr. Longo, Dr. Rigler and Dr. Slade, that was published in Cancer Research in June of 1995, which was titled "Cross asbestos fibers in smoke from original Kent cigarettes." And what he reported in there was that the Micronite filter, as it was called, contained ten milligrams of crocidolite --
MR. BRAKE: Your Honor, I think this is objectionable, the recounting of the article. Object to it as hearsay.
MS. CHABER: It's the basis of his opinion.
THE COURT: Well, I think you better re-ask the question.
MS. CHABER: Q. Based on -- first of all, did you reach any conclusions as to whether the article published by Dr. Longo in Cancer Research was sufficiently trustworthy that it could be relied on in forming your opinions?
MR. OHLEMEYER: I object to that based on relevancy and lack of foundation.
THE COURT: Overruled.

THE WITNESS: I did, and that it was.
MS. CHABER: Q. And have you yourself discussed the topic of that paper with Dr. Longo?
A. I have.
Q. And have you discussed it with other electron microscopists?
A. I have.
Q. And who would that be?
A. Dr. Dodson.
Q. And Dr. Dodson is the person that you've been doing your research with?
A. Yes.
Q. And was Dr. Dodson familiar with Dr. Longo?
A. Yes.
Q. And do they practice in the same field?
A. They do.
Q. And can you tell me, based on your conversations with Dr. Dodson, whether you felt that Dr. Longo's work was scientifically acceptable?
MR. BRAKE: Objection, Your Honor, specifically to the Dr. Dodson portion. If she wants testimony about Dr. Dodson, he should have to testify. I would suggest that's hearsay.
THE COURT: Restate the question.
MS. CHABER: Q. Doctor, in looking at articles published in the scientific literature, do you discuss articles with other scientists looking at the validity of the articles?

A. Yes.
Q. And is Dr. Dodson someone who you discuss the

3 scientific validity of articles with?
4 A. Yes, Dr. Dodson is the person I do research with and,
5 in my opinion, his methodology in his laboratory that he
6 does asbestos fiber analysis by is excellent.
7 He tells exactly what he does, he tells the
8 methodology of what he does, and he indicates the results
9 and what the results are based on.
10 And I was discussing this issue with him
specifically
11 concerning whether or not he thought the results that were
12 obtained in Dr. Longo's laboratory were valid.
13 Q. And did you satisfy yourself, after discussions with
14 Dr. Dodson and reviewing the article yourself, that the
15 conclusions that he reached in that article were
16 scientifically valid?
17 A. I did.
18 MR. BRAKE: Objection, Your Honor.
19 THE COURT: Overruled.
20 THE WITNESS: I did, and the reason was that
21 Dr. Dodson informed me that both his laboratory and
22 Dr. Longo's laboratory were approved.
23 MR. OHLEMEYER: Your Honor, I don't mean to
interrupt
24 the witness, but what Dr. Dodson told him is hearsay.
25 THE COURT: Don't tell us what Dr. Dodson told you
or
26 what anybody else told you, form your own opinions and
state
27 them.
28 THE WITNESS: I was trying to find out the validity
of

1 the tests that were being done on the Kent cigarettes with
2 respect to whether these results were accurate.
3 And the question arises: Well, how do you know
4 whether something is accurate that has been published? And
5 what one has to do is try to gain insight into the
6 methodology that is done in various laboratories.
7 And I'm very familiar with Dr. Dodson's methodology,
8 because I have sent samples to him. He has told me exactly
9 what he has done. He has sent the results back, he has
sent
10 back the electromicrographs, which has shown the various
11 fibers that he has analyzed, he has sent back energy
12 dispersive x-ray analysis spectrums, and I was trying to
13 find out exactly the same information concerning Dr.
Longo's
14 laboratory.
15 What I was going to say is that Dr. Longo's
laboratory
16 and Dr. Dodson's laboratory have been approved by the
17 government to conduct tests on asbestos fiber analysis on
18 air samples that were done when abatement was being done,
19 and the criteria that those laboratories had to uphold or
20 had to adhere to to be accredited by that agency was very
21 high standards.
22 And I think that, by itself, would make Dr. Longo's
23 data in his laboratory, at least in my way of thinking,
24 acceptable to do a study, and that one could assume that
the
25 validity of that study was correct.
26 MR. OHLEMEYER: Your Honor, I'd move to strike the

response as nonresponsive and again, hearsay reiteration of what either of these laboratories may or may not have been

accredited to do. And I'd like to ask the witness a few questions.

THE COURT: Sure. I'll deny the motion to strike, but go ahead and ask him questions.

VOIR DIRE EXAMINATION BY MR. OHLEMEYER

MR. OHLEMEYER: Q. You do know Dr. Longo?

A. I do.

Q. An in fact, you've talked with Dr. Longo?

A. I have.

Q. And you've talked with Dr. Longo about this experiment?

A. Yes.

Q. And have you asked Dr. Longo about the methodology and materials used in his experiment?

A. I've talked to him about that. They are indicated in the paper that he wrote.

Q. But what have you talked -- what has Dr. Longo told you about his materials and his methodology beyond what's written in the paper?

A. I not sure I understand what you mean. You mean exactly how he prepared the sample and that type of thing?

Q. Exactly.

A. That's given in the paper.

Q. You don't know any more about what Dr. Longo did besides what's recited in the paper?

A. I don't know any more than exactly what is recited in the paper. I have an idea, from working with Dr. Dodson, exactly how these tests are done and what type of structures

are analyzed.

Q. Has Dr. Dodson ever done a test where he's taken a cigarette and put in it a syringe and tried to smoke it?

A. Dr. Dodson hasn't done that type of experiment exactly.

MR. OHLEMEYER: Thank you, Doctor.

I would renew my objection, Your Honor.

THE COURT: I don't know what the objection is.

MR. OHLEMEYER: The objection is to strike the last answer as nonresponsive, and let's have this witness tell us what he thinks about the materials and methodology, without telling us what somebody else told him. And then at the appropriate time we will ask him the source and the basis of his opinions.

THE COURT: That's an appropriate question, but I deny the motion to strike.

CONTINUED DIRECT EXAMINATION BY MS. CHABER

MS. CHABER: Q. Dr. Hammar, did you satisfy yourself

19 that the study that was done by Dr. Longo was reliable?
20 A. Yes.
21 Q. And I think you noted that Dr. Dodson, who you worked
22 with in research, has sent you photomicrographs?
23 A. Several times, yes.
24 Q. And these are photomicrographs from what?
25 A. These are photomicrographs of samples that I have sent
26 him for asbestos fiber analysis. And these have been
27 primarily lung tissue.
28 Q. And have you looked at photomicrographs with an eye

1 towards determining whether or not there was asbestos on
2 them?
3 A. I have, and I have looked at the energy dispersive
4 x-ray analysis spectrums that he's created, and I've used
5 two of those photographs that he supplied me in a chapter
6 that I wrote in the book that is edited by Dr. Balmes.
7 MS. CHABER: At this time Your Honor, I'd like to have
8 marked plaintiffs next in order three photomicrographs.
9 (Plaintiffs' Exhibits 11, 12 and 13 marked for
10 identification.)
11 MS. CHABER: May I approach the witness?
12 THE COURT: Sure.
13 MS. CHABER: Q. Dr. Hammar, I'm handing you three
14 photomicrographs that I believe on the back have been marked
15 as 11, 12 and 13.
16 A. Yes.
17 Q. And can you tell me what those are?
18 MR. OHLEMEYER: Objection, Your Honor, lack of
19 foundation and 2034 objection.
20 THE COURT: Overruled.
21 THE WITNESS: These are electromicrographs that I
22 can't tell the exact magnification of, but what they show
23 here are fibers. And the definition of a fiber is a
24 structure that has a length, width, ratio greater than
25 three. That's referred to as an aspect ratio, which means
26 that its lengths is three times greater than its width.
27 The thing that I can see here in these photographs are
28 that these fibers are what are called electron dense. They

1 have the density to them that impart this black color in
2 this photograph, which is a black and white photograph.
3 I also can tell that these fibers are thin and that
4 they have very smooth edges, at least most of them, when you
5 can see the individual fibers. I can't tell exactly what
6 these fibers are. All I can tell you is that they have an
7 appearance identical to what I have seen other asbestos
8 fibers have, namely amphibole asbestos, amosite and
9 crocidolite. They also could be chrysotile.
10 If we had some good cross-sections of these fibers
11 where you had a picture where you had, say, cut across it
12 like this and you could look at it on end, you could tell
13 the difference, or you could tell if it was chrysotile. You

14 couldn't probably tell if it was amosite or crocidolite, but
15 you could tell the difference between a chrysotile fiber and
16 an amosite and crocidolite fiber, because it's hollow.
17 All I can say is these pictures here show fibers that
18 have an appearance that are consistent with being asbestos
19 fibers.
20 Q. Let me ask you if they have an appearance consistent
21 with cellulose acetate?
22 MR. OHLEMEYER: Objection; lack of foundation.
23 THE COURT: Lay the foundation.
24 MS. CHABER: Q. Have you seen photomicrographs of
25 cellulose acetate?
26 A. I have.
27 Q. Do they have, 11, 12 and 13, Plaintiffs' Exhibits, do
28 they have the appearance consistent with cellulose acetate?

1 A. No.
2 Q. Have you seen cotton fibers on photomicrographs?
3 A. Yes.
4 Q. And Exhibits 11, 12 or 13, are they consistent with
5 the appearance of cotton fibers?
6 A. Not the ones that I've seen, no.
7 Q. And are they consistent with the appearance of crepe
8 paper?
9 MR. OHLEMEYER: Same objection.
10 MS. CHABER: Q. Have you seen crepe paper --
11 A. I don't know if I've ever seen crepe paper on
12 electromicrographs, so I couldn't really answer that. I've
13 seen paper, ordinary paper, and they don't look like that,
14 but I don't know about crepe paper, per se.
15 Q. Let's assume that the four potential sources of what
16 we see in those photomicrographs in 11, 12 and 13 are
17 cellulose acetate, crocidolite asbestos fibers, cotton
18 fibers and crepe paper. Do you have an opinion as to what
19 is likely depicted there?
20 A. Crocidolite asbestos fibers.
21 Q. Now, when asbestos fibers, crocidolite asbestos fibers
22 are inhaled into the lung, can they break down within the
23 lung?
24 A. They can break down to a minor degree. They usually
25 do not break down to any significant degree. And the
26 majority of amphibole fibers, be it amosite or crocidolite,
27 stay intact in the lung. About 20 percent of them get
28 cleared, but most of them stay intact.

1 Q. And we were talking earlier this morning about
2 different diseases that asbestos can cause and some of the
3 benign diseases or the noncancerous ones.
4 Was there any evidence, in any of the materials that
5 you reviewed with respect to Dr. Horowitz, of any other
6 asbestos-related diseases?
7 A. Not that I reviewed. There was mention made that he
8 may have had a plaque, but I did not see that in the

records
that I reviewed.
Q. If Dr. Horowitz had a plaque, what would be the
significance of that?
A. It would mean to me that he was exposed to asbestos
in
an occupational or a bystander setting.
Q. Do people who have mesothelioma caused by asbestos
necessarily have evidence of another asbestos-related
disease?
A. No.
Q. How common is that, that a person will have a
mesothelioma related to asbestos and not have evidence of
another asbestos-related disease?
A. Fairly common. The most common thing that you'll
see
in people who have mesotheliomas, as far as other
asbestos-related diseases go, are hyaline pleural plaques,
and these may not be seen on x-ray.
There's a good study showing what percent of them
are
seen in x-ray versus what percent are seen at autopsy, and
by far, there are far more seen at autopsy than there are
radiographically. And the lower you go in concentration

with respect to asbestos in the lung tissue, the less
likely
you are to see the plaques.
So I would say in all of the cases that I've
reviewed,
of all the mesotheliomas I've reviewed, I would say
probably
30 or 40 percent of them do not have any other
asbestos-related disease, as far as in the medical records.
If I were to base it on an autopsy series, say my own
autopsy series of patients with mesothelioma that I've done
autopsies on who have been exposed to asbestos, I would say
probably only 15 percent of them don't have plaques. The
majority of them do.
Q. And these are plaques that were not seen when the
person was clinically diagnosed while they were alive?
A. Some of them were seen and some of them were not
seen.
Again, the smaller they get -- and the ones that are
noncalcified are the ones that are usually not seen -- the
more frequent they are. And the more calcified they are,
the easier they are seen by radiographs.
Q. And in an individual who has a mesothelioma that is
encasing their entire lung, can it be difficult to
visualize
that on x-ray to see a plaque?
A. That --
MR. BRAKE: Objection; leading, Your Honor.
THE COURT: Don't lead. Restate the question.
MS. CHABER: Q. In an individual who has a
mesothelioma that's encasing the lung, what effect would
that have on the ability to visualize a pleural plaque?
A. It could make it impossible to visualize the pleural

plaque on the site where the tumor was.
Q. Are there other causes of mesothelioma besides

asbestos?
A. There are other -- that are other causes. From a practical point of view, the other causes are minimal, and I think the ones that have been accepted, there is a fiber that is used in construction in central Turkey, and in that neighborhood called aronite, a-r-o-n-i-t-e, that physically is almost identical to asbestos. It's a silicate-type mineral like asbestos is.

There's a high incidence of mesothelioma in that area of Turkey where they use that material in an occupational way. Aronite is present in the United States primarily in the Southwest United States, and as far as I know, there's never been a case of mesothelioma associated with aronite in the United States.

Q. Is that the same as zeolite?

A. Aronite is a type of zeolite. There also are zeolites used in filters, but it's not in a fiber form and it's used as a way to purify things.

Another cause that has been reported in the literature, the last time I checked there were 12 reported cases of, and that is cases of people who have received therapeutic radiation for other types of cancers have developed mesothelioma in this cytoradiation field, but the incidence of that, if you were to look at it epidemiologically, would be nil, because there are probably so few cases of that seen and so many people that receive

therapeutic radiation, that that probably wouldn't be over what is considered background, but that does happen.

And then there are a number of case reports in the literature of mesothelioma occurring in certain unusual settings. And an example of this would be there have been a couple of pleural mesotheliomas occur in people who had tuberculosis pleuritis, specifically people who have have had tuberculosis pleuritis, in which people have been treated with air insufflation, in which air has been injected into the pleural cavity to collapse the lung. And that used to be an old way to treat TB. That was in the '40s and '50s. There are a couple cases reported like that.

There are a couple cases reported in people who had injuries to the pleura for other reasons, trauma, a case of peritoneal mesothelioma in a person who had a disease called familial Mediterranean fever. But if you look up studies to see if this type of causation has continued to be reported, it has not. There has not been, for example, cases of tuberculosis pleuritis associated with mesothelioma that I could find in the last 15.

So there are a few anecdotal cases that,

epidemiologically, have not continued to be found to be associated with asbestos. The only one that I think epidemiologically would be associated is the aronite, which is a fibrous mineral very similar to asbestos that's used commercially in some parts of the world.

Q. And are there some mesotheliomas called idiopathic mesotheliomas?

A. There are.

Q. What is idiopathic?

A. That means that the cause is not known. That doesn't mean that there isn't a cause, it just means that the cause has not been determined.

And there are a lot of diseases that are idiopathic. And if you look at the studies on mesothelioma that have been reported, as many as 20 percent of cases of mesothelioma in men and up to about 50 percent of cases of mesothelioma in women -- in some studies more, some studies less -- have stated to be idiopathic, which means that as far as can be determined with the information available, there was no obvious cause of that mesothelioma.

Q. And do you think that 20 percent -- does that mean that these are mesotheliomas that have occurred spontaneously?

A. That's what that suggests, but I don't personally believe that.

Q. And why not?

A. I think there always is going to be a cause of those diseases. It's may be that we haven't identified the cause or we don't understand some of the implications of the specific causes of mesothelioma, namely asbestos.

It could be that in certain individuals, it takes very little asbestos to cause mesothelioma; maybe even a concentration that's not considered even over background, but there's no way to prove that easily, because you would not find an increased incidence of that situation in a study

unless you had just huge numbers, and you probably could never prove it.

Q. Is mesothelioma a common disease?

A. No, mesothelioma is an extremely rare disease, and the incidence that it occurs in what is stated to be the background population is about two to three cases per million people per year. And that's in contrast to, say, lung cancer, in which there's 170,000 cases in the United States per year and 170,000 in the population, what, of about 250 million.

Q. And is there a threshold of exposure to asbestos below which people don't get mesothelioma?

MR. OHLEMEYER: That's been asked and answered, Your Honor.

THE COURT: Overruled.

THE WITNESS: There is no threshold over which people

do not get mesothelioma. What's not known is what is the lowest threshold, and that's kind of the problem, is that we don't know what the lowest threshold is.

We do know that of all the asbestos-related diseases, mesothelioma and pleural plaques seem to be the ones that can occur in the lowest concentrations of asbestos in the lung tissue when you do that determination.

What we don't know is the minimal amount of asbestos that it takes to cause those diseases. There have been cases reported, as I mentioned earlier, of mesothelioma in which people have not had any increased concentration of asbestos in their lungs who have been thought to have been

exposed to asbestos in an occupational setting.

And the other thing that that also raises is the possibility, and this is why Dr. Dodson and I are doing this one study, is that perhaps when we analyze the lung tissue of some of those individuals and do not find elevated concentrations of asbestos, maybe we are not looking at the right tissue. Perhaps we should be looking at the pleura and determining what the concentration is of the asbestos in the pleura where the tumor begins. And maybe if we did that, then we would find an elevated concentration.

The other thing about the idiopathic mesotheliomas is that a lot of the cases are stated to be idiopathic based only on the clinical history. And sometimes the clinical history is such that the right questions have not been asked with respect to whether a person was exposed to asbestos or not.

MS. CHABER: Q. And in the cases that are reported where there's no stated cause or known cause of the mesothelioma and there's been a fiber burden analysis done with that, what's the location from which the fiber burden analysis is being done?

A. It's generally done from the lung tissue.

Q. And the location of the tumor is in the lining of the lungs; correct?

A. That's correct.

Q. In terms of Dr. Horowitz, do you believe that his mesothelioma is idiopathic?

A. No.

Q. And why is that?

A. Because I believe that he was exposed to asbestos in a concentration that was capable of causing his mesothelioma.

Q. And the most likely source of that?

A. Kent cigarettes.

Q. Assuming that Dr. Horowitz smoked one pack per day of Kent cigarettes for four years while they contained crocidolite asbestos, and assume further that rather than being a puffer, he inhaled his cigarettes.

And assume further that the time frame while he was

smoking these Kent cigarettes was at the same time frame that he was working at Western Reserve University and was around the construction site at the Hanna Pavillion.

Do you have an opinion as to whether or not the smoking of the Kent cigarettes during that time frame would be a contributing factor to his mesothelioma?

A. I do, and that they would.

Q. And can the body's defense mechanisms, can they be affected by how much asbestos someone is inhaling at a given time?

A. They can.

Q. And how would they be affected?

A. Well, you can overwhelm any system if you have as much -- enough asbestos or any dust, if you have enough dust that you're breathing in, you can exhaust the defense mechanisms that are present. And even though most of the asbestos may be cleared, some of it does get to the tissue where it can cause injury.

Q. And is it known how many fibers it actually takes to cause the disease mesothelioma?

A. It's not known, no.

Q. Is it known how many cells have to be affected before the disease mesothelioma is created?

A. That's not known, either.

Q. Dr. Horowitz had a prostate cancer?

A. He did.

Q. And he's presently being treated for that?

A. He is, yes. I have not kept up with his treatment on that. In 1991, at the end of that, he was treated with Lupron and Flutamide, which are two hormonal-type agents that are synthetics that are commonly employed to treat that type of cancer.

Q. Assume that he continues to this day to be treated with those two hormonal agents, the Lupron and the Flutamide, and assume that his PSA levels have remained at zero as a result of that treatment.

Based on what you know, what is the prognosis for Dr. Horowitz as a result of the prostate cancer?

A. It's excellent, given that scenario. That means he does not have any recurrent tumor if his PSA is zero. And I know from the studies that were done in 1991, he did not have any convincing evidence of bone metastases. There was a question of the third lumbar vertebrae, but nothing else.

Q. And from 1991 to now, if he had bone metastases, would you expect it to have showed up?

A. Yes.

Q. Can you tell us what is the prognosis for Dr. Horowitz as a result of the mesothelioma?

A. It's not very good. The average survivor, if you

take
all that have mesothelioma, the average survival from the time of diagnosis to death is 9 to 12 months. There are some factors that enter into that in which people can live longer. Younger people live longer than older people. People that have epithelial mesotheliomas tend to live longer than those with sarcomatoid mesotheliomas.
Q. And the epithelial is the type that Dr. Horowitz has?
A. Right. People who have a good performance status, which means that they are basically healthy otherwise, live longer than people who are generally sick.
There are some people who show an initial response to some chemotherapy, and the chemotherapy that has been tried is usually a combination of Cytoxin Adriamycin, sometimes cis-platinum, sometimes Velban, and I've seen another experimental drug used on mesothelioma called Taxol, T-a-x-o-l, and some people respond to that, but the people that I have reviewed cases on have always developed recurrent tumor, even though they have initially responded and have died of their mesothelioma.
Q. Do you have any information with respect to whether Dr. Horowitz had any chemotherapy?
A. I do.
Q. And did he?
A. He did.
Q. Do you know how he responded to the chemotherapy?

A. The reports that you showed me indicated that he did respond and that there was a shrinking of his tumor, and even though there was a shrinking of the tumor, the tumor still was stated to encase the entire lung, but had got considerably thinner, so I would say that his tumor has shown a good response to the chemotherapy.
Q. Is that unusual?
A. In my experience, yes, quite unusual.
Q. Does it mean that he's cured?
A. No, it doesn't. A lot of people will show a good response to chemotherapy initially, and then die from their tumor.
MS. CHABER: I'd like to have two medical records marked.
MR. OHLEMEYER: No objection.
(Plaintiffs' Exhibits 14 and 15 marked for identification.)
MS. CHABER: For the record, we've marked as Plaintiff's Exhibit 14 a pathology report from Memorial Sloan Kettering Cancer Center dated 10-5-94, and as exhibit 15, a pathology report from Cedar Sinai Medical Center dated 8-29-94. And I believe there was no objection to them going into evidence.
(Plaintiffs' Exhibits 14 and 15 received in evidence.)
MS. CHABER: Q. Dr. Hammar, what are those two medical records, 14 and 15?

A. These are pathology reports from -- one from the Cedar Sinai Medical Center in Los Angeles, and another one from Memorial Sloan Kettering Cancer Center in New York City.
Q. And did you review those prior to coming to your opinion?
A. I did see these, yes.
Q. And the treating physicians in those cases, were their opinions consistent with yours with respect to the diagnosis of mesothelioma?
A. Yes.
Q. And you've done work with Sloan Kettering?
A. I have done work with them. In fact, I'm going back there next Thursday to give a talk at Sloan Kettering on mesothelioma for their pathology department.
Q. And are they a reputable and knowledgeable facility?
A. They are one of the leading cancer institutes in the world.
Q. Dr. Hammar, what is the likely course that the mesothelioma will take in Dr. Horowitz?
A. The likely course is not --
MR. OHLEMEYER: Your Honor, I'm sorry, the objection I have is to the form of the question. From a pathological perspective? The doctor is a pathologist.
THE COURT: I understand. All right.
MS. CHABER: Q. Dr. Hammar, you've seen a lot of mesothelioma cases?
A. I've seen a lot of mesothelioma cases, I've done autopsies on a lot of mesothelioma cases, I've read clinical records on a lot of mesothelioma cases. I'm involved. I'm the chairman of our cancer committee at the Harrison

Memorial Hospital where we discuss every mesothelioma at our tumor board when that occurs. I've seen a lot of cases of this disease.
Q. Do you only discuss the microscopic and pathological course of the disease?
A. In our cancer committees when we discuss these patients, the majority of it is devoted to the clinical presentation, the radiographic findings, and what they are going to do to the patient.
They do ask for the pathologist to indicate what the diagnosis is, but then they go on to discuss the treatment, if any, for the patient, and what the expected outcome is.
Q. What is the likely course that the mesothelioma will take in Dr. Horowitz?
A. The likely course is that it will recur, that it will grow, and that it will cause his death.
MS. CHABER: Thank you. I have nothing further.
CROSS-EXAMINATION BY MR. OHLEMEYER
MR. OHLEMEYER: Q. Dr. Hammar --
MR. OHLEMEYER: Before I start, may I?

MS. CHABER: Sure.
MR. OHLEMEYER: Q. I'm Bill Ohlemeyer, Dr. Hammar. I represent Lorillard. We've met before.
A. We have.
Q. I've taken your deposition.
A. You have.
Q. Let me ask you a question here real briefly before we start.

Just so I'm clear, there is no evidence that cigarette smoking is a factor in the development of malignant mesothelioma; is that right?
A. That's what I said in that book, and that relates to the fact that cigarette smoke does not decrease or increase the incidence of mesothelioma.
Q. So that's a correct statement, there is no evidence that cigarette smoking is a factor in the development of malignant mesothelioma?
A. When that book was written, that is a correct statement.
Q. Okay. The vast majority of people who develop mesothelioma do so as a result of occupational exposure to asbestos?
A. That's correct.
Q. What you do as a pathologist at the hospital is very different than what you do here today; right?
A. I certainly don't testify at the hospital, that's for sure, yes.
Q. But what you do at the hospital is look at things under the microscope and tell other doctors whether you think they are or are not cancer?
A. That's part of what I do, yes.
Q. And, for example, there may be a surgeon who takes a biopsy, brings it down to your laboratory, you look at it under the microscope, and you say: This looks like cancer, or it doesn't look like cancer?
A. On a frozen section, fair enough, yes.

Q. And when you look at something under the microscope, when you look at cancer under the microscope, you can't determine what causes the cancer just by looking at it, can you?
A. You cannot, that's correct.
Q. And there is no cancer that has only one cause, is there?
A. There are very few cancers that have one cause. I think that you asked me this in deposition, and I gave a couple examples that might be pertinent. One would be Burkitt's lymphoma caused by Epstein-Barr virus. Another might be nasopharyngeal carcinoma, and another might be hepatocellular cellular carcinoma, usually found in the Orient, caused by Hepatitis-B virus.
But most cancers have more than one cause, and it may be difficult to identify the exact causes.
Q. And, in fact, most cancers don't have an

identifiable
18 cause?
19 A. Well, most cancers don't, but there are some that
do,
20 like I just mentioned. And also the angiosarcomas of the
21 liver has been with vinyl chloride exposure, and that's
22 accepted as a cause of that type of cancer. Many cancers
we
23 cannot determine the cause.
24 Q. So at least somewhere between many and most, you'll
25 agree with me, the cause can't be determined?
26 A. Fair enough.
27 Q. And knowing the risk factor, the things that are
28 associated with the development of a cancer, isn't the
same

1 thing as knowing what caused the cancer in a particular
2 case?
3 A. That's correct.
4 Q. Okay. Mesothelioma can be caused by asbestos?
5 A. Right.
6 Q. By therapeutic radiation?
7 A. Right.
8 Q. By a mineral known as arenite?
9 A. Correct.
10 Q. Genetic defects are associated with the development
of
11 mesothelioma?
12 A. The genetic defects, I think I kind of explained
that
13 earlier, there is evidence that there could be a familial
14 genetic relationship to mesothelioma, and we reported
those
15 cases that I've already mentioned about in three brothers
16 and a father and son.
17 The genetic association, though, is not as simple as
18 genes cause the cancer. It's usually that genes lead to
19 some product or some enzyme system that then causes
certain
20 things to happen in the body that then relates to the
21 cancer.
22 It's not that here you have a gene and you say this
23 gene's going to cause cancer. It's more complicated or
24 maybe more subtle than that with respect to the genes in
25 lung cancer and asbestosis. It's thought to be a
deficiency
26 in the glutathione transferase enzyme mu that's deficient
27 that leads to the inability to detoxify certain things
like
28 asbestos.

1 And with respect to all of those familial cancers, be
2 it associated with cigarette smoke or whatever, it's also
3 related to some specific change, molecular biology that
4 leads to the cancer.
5 Q. And hereditary factors are considered potentially
6 important in the development of mesothelioma?
7 A. Well, genes and hereditary are basically the same
8 thing. Hereditary relates to your genes.
9 Q. And that statement, hereditary factors are considered
10 potentially important in the development of mesothelioma?

A. Potentially, and that's what I said, and that's based on the article that we published, and I just indicated that I just reviewed that article for Cancer, and they didn't come to any specific conclusion with respect to whether genetic factors are absolutely important.
Q. There are recent investigators that have suggested certain viruses might be associated with the development of mesothelioma?
A. That's true.
Q. And potentially any agent or substance or event that can injure pleural tissue has the potential to cause mesothelioma?
A. It does, and that's why I was telling you about those anecdotal cases, or telling the jury about the anecdotal cases that have been reported, and that has happened on extremely rare occasions.
Q. And mesothelioma occurs in animals?
A. It does.

Q. And mesothelioma occurs in infants and children?
A. It does.
Q. And in most of the cases in which it occurs in infants and children, it's not been associated or proven to be caused by exposure to asbestos?
A. That's correct.
Q. 20 percent of the mesotheliomas in men and 55 percent of the mesotheliomas diagnosed in women give no history of exposure to asbestos or other potentially causative agents, and no history of previous pleural injury?
A. That's what's been published in the literature, yes.
Q. There may be things that cause mesothelioma that have not yet been discovered?
A. That's a possibility, yes.
Q. Or identified?
A. Possible, yes.
Q. And the fact that there are known causes for a tumor suggest that there may be other causes for that tumor that have yet to be identified?
A. I don't think those two are related. I think just because they are known causes of tumor doesn't mean there are other causes that could be related. There's always potential other causes that may cause a certain disease that we don't know about.
Q. The pleural diseases you talked about earlier this morning. There are also pleural diseases that are unrelated to exposure to asbestos?
A. That's true.

Q. And the stains that you were talking about with the names like Leu M-1 and human milk fat protein globule, those stains, those stains are things that you apply to tissue to determine whether something's a certain type of cancer as

opposed to another type of cancer?
A. That's basically the idea, yes.
Q. Those stains don't tell you anything about the cause of the cancer?
A. That's correct.
Q. Now, there are indications or signs that a pathologist can look for in medical information to detect an exposure to asbestos?
A. There are.
Q. Asbestosis is one of them?
A. Yes.
Q. Hyalinized pleural plaques is another one?
A. Yes.
Q. Pleural thickening without a diagnosis of a tumor is another one?
A. Yes.
Q. And an elevated level of asbestos in one's lung?
A. That's correct.
Q. More than you would expect to find in the general population?
A. Yes.
Q. There are three common types of asbestos fibers that you told us about: Amosite, crocidolite, chrysotile?
A. Correct.

Q. And they are all capable of causing mesothelioma?
A. They are.
Q. And chrysotile was the type of asbestos that was most commonly used in buildings and insulation material in this country?
A. In general, yes.
Q. And chrysotile is often found in the mine with another type of amphibole asbestos known as tramolite?
A. It is.
Q. And tramolite can also cause mesothelioma?
A. It can be, yes.
Q. And the most common cause of mesothelioma in this country is amosite asbestos?
A. That's correct.
Q. And amosite asbestos is thought to cause more mesothelioma in this country than chrysotile asbestos, which is thought to cause more mesothelioma than tramolite, which is thought to cause more mesothelioma than crocidolite?
A. That's correct, in this country, yes.
Q. Combined, amosite, chrysotile and tramolite cause more mesothelioma than crocidolite?
A. That's correct, in this country.
Q. And amosite was the type of fiber that was used most often in the Navy in ships' pipe insulation?
A. That's correct, also.
Q. And when you do laboratory experiments -- do you remember you drew the picture of the cell and you talked about the DNA?

A. Yes.

Q. Do you know what I'm talking about?
A. Yes.
Q. When you do those types of experiments in a laboratory, it's chrysotile asbestos that appears to cause the most damage to DNA?
A. In the experiments that have been done in culture, yes.
Q. And when you look at pleural tissue, what you find most often is chrysotile asbestos fibers?
A. That's the dominant fiber in that location, yes. You can find amosite and crocidolite there, also.
Q. But what you find most often is chrysotile?
A. The highest concentration is chrysotile. It depends on what the patient's history has been. If a person has never been exposed to any commercial asbestos, you'd find almost only chrysotile, small amounts, usually short fiber.
If the person has been exposed occupationally to asbestos, depending on what it was, you'd find all three types.
Q. Now, you weren't involved in actually diagnosing Mr. Horowitz's cancer?
A. Not as a pathologist involved in this case, no.
Q. You weren't involved in his original diagnosis or his care or his decisions about his treatment?
A. I was not.
Q. Mr. Horowitz's attorneys hired you to review his medical records and look at some pathology specimens?

A. That's correct.
Q. And they are paying you for your time?
A. They are, my laboratory.
Q. What do you charge them for your time?
A. The laboratory charges them $350 an hour.
Q. And a legal assistant at Ms. Chaber's office named Ray Goldstein sent you a letter in December of 1994 describing this lawsuit, didn't he?
A. He did.
Q. And what he told you was that Mr. Horowitz spent 13 days aboard an Army troop ship at the end of his service in Japan; do you remember that?
A. I forgot about the troop ship, but now that you mention it, that's correct, he did.
Q. And he told you that Dr. Horowitz was close to and often walked through the construction of an addition to the hospital where he was on staff in Cleveland about 1956; do you remember that?
A. That's the Hanna Pavillion.
Q. And Mr. Goldstein told you in the letter that Dr. Horowitz was present during the construction of an addition to the Reiss Davis Children's Center in Los Angeles in about 1967, 1968?
A. Correct.
Q. And Mr. Goldstein told you that Dr. Horowitz smoked a pack per day of Kent filter cigarettes from about 1952

until
27 December 1962, when he quit smoking?
28 A. That's correct, also.

1 Q. And that is everything that you know about
2 Dr. Horowitz, without looking at his medical records or his
3 pathology specimens?
4 A. Well, I also got the information from Dr. Horn in
more
5 detail about what you said Mr. Goldstein said. And this
6 Dr. Horn certainly pored through more details with respect
7 to, say, the Hanna Pavillion, for example. And there's a
8 few more details concerning the building that was being
9 built in Los Angeles, but basically, the same thing.
10 Q. And Dr. Horn is a doctor that Mr. Horowitz's lawyers
11 hired to sit down with him and talk about his potential
12 exposure to asbestos?
13 A. Dr. Horn is a pulmonologist who is an expert in
14 asbestos-related and other types of pulmonary diseases.
15 Q. But that's how Dr. Horn got involved with
16 Mr. Horowitz, isn't it?
17 A. I suspect, yes.
18 Q. He wasn't involved in his diagnosis or his
treatment?
19 A. That's correct.
20 Q. And what you received from Dr. Horn was Dr. Horn's
21 summary of Dr. Horowitz's deposition?
22 A. Fair enough, yes.
23 Q. So everything you know about Dr. Horowitz you either
24 learned from Mr. Goldstein, you learned from the medical
25 records, or is what Dr. Horn told you Mr. Horowitz may or
26 may not have said in his deposition?
27 A. That's correct. And it sounds like there's
something
28 I must be missing about him or something that you know.

1 Q. Let me ask you this, Dr. Hammar. You don't know
2 whether Dr. Horowitz smoked Kent cigarettes when there was
3 asbestos in the filter or not, from personal knowledge?
4 A. That's correct, I don't.
5 Q. You're assuming he did?
6 A. I am.
7 Q. Because he said he did?
8 A. Yes, I believe what he said.
9 Q. And you are assuming that he was exposed to asbestos
10 for 13 days on a troop ship because he said he was?
11 A. Well, the troop ship, I don't know if he necessarily
12 said that he was absolutely exposed. He was on a troop
ship
13 where he could have been exposed.
14 Q. If Dr. Horowitz didn't smoke Kent cigarettes during
15 the years that they had asbestos in them, then you don't
16 have an opinion as to whether they caused or contributed
to
17 cause his mesothelioma?
18 A. If he did not smoke them during that time period?
19 Q. That's right.
20 A. Are you saying that he did not or --
21 Q. I'm just asking you -- I mean, your opinion is based
22 on the assumption that he did; is that right?
23 A. That's correct, yes.

Q. So if he didn't, you don't have an opinion as to whether the cigarettes may or may not have caused his mesothelioma?
A. Well, if he didn't smoke the cigarettes during that time period, then I would say that the cigarettes were not a

cause of his mesothelioma, or the crocidolite asbestos in them. That wouldn't be a matter of whether it was or was not, I would say they were not.
Q. Let me ask you to assume something, Dr. Hammar. Assume he did not smoke those cigarettes during that time period.
A. All right.
Q. Do you have an opinion you can state to within a reasonable degree of medical certainty as to what caused or contributed to cause his mesothelioma?
A. I would say then that there is a chance that the asbestos that he was exposed to at that Hanna Pavillion, which at least, in my way of thinking from Dr. Horn's summary of his deposition, was probably the most significant other exposure that he had, and that could have been enough to cause his mesothelioma.
It's my understanding that he was in close proximity to that building. It was my understanding that he did occasionally go over there to look at the construction that was being done.
Q. He wasn't involved in actually constructing the building?
A. No, he wasn't.
Q. He had an office across the way?
A. Well, it wasn't very far, at least according to what Dr. Horn's report said. It was very close.
Q. Do you recall any reference about asbestos exposure in the medical records that Mr. Goldstein provided you?

By the way, let me ask you one before that, Doctor. Have you read Dr. Horowitz's deposition?
A. I've not read his deposition. I have read all these records, and for example, the record from the Memorial Hospital outpatient progress record from Sloan Kettering states that his asbestos history is uncertain, possibly might have had some asbestos in an old home.
I think there were a couple of other entries in these records that also suggested the possibility of him being exposed to asbestos. Do you want me to keep looking?
Q. That's fine. That's the reference I was thinking of. It's a reference to asbestos in his home?
A. That one was. That had to do with the tile he replaced in his basement in Los Angeles.
Q. Do you recall a reference to asbestos in his home in Los Angeles?
A. That's what I thought that one was probably talking about.
Q. Let me ask you to assume that Dr. Horowitz had asbestos tile in a home in Cleveland.

A. Okay.
Q. Do you have any information about asbestos in his basement in Los Angeles?
A. No, other than that was mentioned that the home in Los Angeles was in poor repair and he may have been exposed to asbestos there.
Q. Dr. Horowitz doesn't have asbestosis?
A. No.

Q. There's no evidence that you've seen that he has bilateral pleural plaques?
A. No. The only thing that I have been told was that there was a suggestion that he had a plaque on the left hemidiaphragm, which was the side opposite his tumor.
Q. And who told you that?
A. Ms. Chaber told me that, and she said that was based on a review of radiographs by Dr. Barry Horn.
Q. Have you seen the report from Tower Imaging, the CT scan of June 1995 that describes Dr. Horowitz's CT scans?
A. I've seen some of those reports. I don't know. Do you want to show that to me?
Q. Sure. Let me hand you a June 14th, 1995 report from Dr. Hamlin to Dr. Rosenbloom,
MR. OHLEMEYER: And I guess, Your Honor, I ought to mark it for identification.
THE CLERK: This is Defendant's Exhibit A. I'll put an L on it for Lorillard.
(Defendants' Exhibit A marked for identification.)
MR. OHLEMEYER: Q. Let me hand you, Doctor, what we've marked as Defendants' A, and ask you if you've ever seen that?
A. I have seen that, yes.
Q. And what we've talked about as plaque is often referred to as calcification; is that right?
A. It sometimes can be referred to as calcification, yes.
Q. Read the last sentence of the paragraph right above the paragraph marked "impression" for us.

A. "The calcification seen in the pleural mass in the right costophrenic sulous on the previous examination are no longer visualized."
Q. And what that suggests, Doctor, is that there is no radiological CT scan evidence of a pleural plaque?
A. That doesn't necessarily mean that to me. I mean, I'm no radiologist, but I guess I know enough from looking at reports that on some radiographic studies, something will be visualized, and on another radiographic study, the same thing will not be visualized.
And I can't make any comments on that, but I just know, from looking at CT scan reports, depending on how they are done and where the cuts are made, that you may see something on one that will be reported on another and will not be reported.
Q. Let's put it this way, Doctor. Dr. Hamlin has seen the CT scan?

18 A. Yes, but that doesn't necessarily mean that if he saw
19 a different CT scan and then had a previous CT scan, that
20 just because the current CT scan didn't show something that
21 it's not there.
22 Q. Dr. Hamlin didn't see a calcification on this CT scan?
23 A. That's fine, yes, I agree with that.
24 Q. Dr. Horowitz didn't have any evidence of pleural
25 thickening in the absence of his tumor?
26 A. Just the tumor site, that's correct.
27 Q. And, of course, there's been no analysis of lung
28 tissue to determine whether there is any asbestos in

1 Dr. Horowitz's lungs, or whether there is more asbestos in
2 those lungs than you would expect to find?
3 A. That's correct, there's not been a sample available
4 for that.
5 Q. In your experience, Doctor, the majority of pleural
6 mesotheliomas do not shrink in size in response to
7 chemotherapy?
8 A. I've already said that the majority of them do not.
9 There are a few cases in which people will show an initial
10 response and have some shrinkage, but the majority of them
11 are unresponsive to chemotherapy.
12 Q. The original diagnosis in this case, at first
13 Dr. Horowitz's treating physicians suspected he might have
14 adenocarcinoma of the lung; isn't that right?
15 A. They did, yes.
16 Q. And, in fact, in your first report, that was one of
17 the possibilities that you mentioned as a diagnosis in this
18 case?
19 A. Sure. It's always a possibility, and that's because
20 the adenocarcinomas and epithelial mesotheliomas can look
21 essentially identical by light microscopy, and that's why
22 there are people like myself who try to figure things out
23 like that.
24 Q. And you told us a few moments ago that there were a
25 hundred to 120,000 cases of adenocarcinoma of the lung in
26 this country each year?
27 A. Well, there's about 170,000 new cases of lung cancer a
28 year, and depending on what series you look at, to maybe
30

1 to 40 percent of those are adenocarcinomas, so 40 percent,
2 say, of 170 is what?
3 Q. 35,000?
4 A. Okay. Is that right? I don't know. It's more than
5 that. It's almost half. It would be about 70,000.
6 Q. You're right, 70,000.
7 And the numbers, the cases of mesothelioma you gave us
8 is a number per million, but in terms of actual cases, there
9 are about 1,500 to 2,000 cases a year in this country?
10 A. There are. And the number of cases that one sees is
11 going to be dependent on what geographic location you're in.

12 If you're in Kansas, where there has never been a shipyard,
13 you might not see many cases, but in you're in Bremerton,
14 Washington, where there's a shipyard, you're going to see a
15 lot of cases.
16 Q. And one of the characteristics of mesothelioma, or any
17 other type of cancer, is its ability to spread?
18 A. That's one of the features of cancer in general.
19 Certain cancers have a propensity to metastasize or spread
20 more than others. In the lung, for example, small cell
21 carcinoma spreads at a very early stage of the disease,
22 where squamous cell carcinoma will only metastasize only
23 often in the later stage of the disease.
24 Q. And at the time of his diagnosis with prostate cancer,
25 Dr. Horowitz's cancer had spread to at least one of the
26 lymph nodes in the pelvic region?
27 A. Only one lymph node that I know of.
28 Q. In your report, Doctor, you describe some information

1 about Dr. Horowitz's smoking history that he apparently
2 described to Dr. Horn?
3 A. Right.
4 Q. And you note that Dr. Horowitz recalls the filter, the
5 color of the filters on the cigarettes he smoked as being
6 blue?
7 A. That's what Dr. Horn's report said that he said, yes.
8 Q. Is there a reason you noted that in your report?
9 A. Just because that's what he said.
10 Q. Okay. Now, let's talk about Dr. Longo for a moment.
11 A. All right.
12 Q. In connection with this case, Ms. Chaber's office
13 provided you with some information about Dr. Longo's
14 experiment?
15 A. They did.
16 Q. But you already knew that Dr. Longo had done an
17 experiment like that?
18 A. I did, yes.
19 Q. In fact, you've known that for almost two years;
20 right?
21 A. Two years? It's been awhile. I'm not sure it's been
22 two years. I thought I first called him last year some
23 time. I don't think it's been two years, but maybe it has.
24 I've talked to him, I think, on three or four occasions, and
25 on two occasions before I was involved with this case.
26 Q. Did Dr. Longo tell you that he had done his
27 experiments at the request of plaintiffs' attorneys and had
28 been paid by plaintiffs' attorneys to do the experiment?

1 A. As I recall, he didn't tell me that, no.
2 Q. Did he refuse to discuss the experiment with you or
3 tell you that he had agreed not to talk about the experiment

4 with you because he wanted to talk with the lawyers who paid
5 for it before he talked with you about it?
6 A. He told me that he did not want to divulge the results
7 of his studies before the paper was published, and I don't
8 recall him saying anything about the attorneys. He just
9 told me he didn't want to tell me that until the information
10 was published.
11 Q. Okay. Whether there might be or might not be asbestos
12 in the smoke from Kent cigarettes was something that you'd
13 thought about before you talked with Dr. Longo?
14 A. I thought about it a long time ago, because there was
15 an article that was initially published in the New England
16 Journal of Medicine.
17 Q. I don't want to interrupt you, Doctor, but you knew
18 there was asbestos in these cigarette filters?
19 A. I knew there was asbestos in there, yes, absolutely.
20 Q. Now, you think that designing a scientifically valid
21 study to determine whether there was asbestos in the smoke
22 from those cigarettes would be fairly simple, don't you?
23 A. No, I don't know if it would be fairly simple, but I
24 think you could basically figure out something that you
25 could do to try to determine that.
26 Q. Okay. Do you recall me asking you that question at a
27 deposition in October of 1994?
28 A. Not specifically, but I wouldn't doubt if you did.

1 Q. We were talking at page 102 of the deposition.
2 MR. OHLEMEYER: Would you like a copy, Your Honor?
3 THE COURT: Yes, please.
4 MS. CHABER: Could I see one, as well?
5 THE COURT: You don't have one?
6 MS. CHABER: No. It's not this case.
7 MR. OHLEMEYER: Q. We were talking, Doctor, about
8 this topic, and I asked you --
9 MS. CHABER: I'm going to object, Your Honor. I don't
10 think there's anything inconsistent in his using this to
11 impeach Dr. Hammar. I don't see anything inconsistent.
12 MR. OHLEMEYER: Let me ask the question again.
13 Q. Do you think designing a study to determine whether
14 there was smoke asbestos in the smoke from these cigarettes
15 would be fairly simple?
16 A. I think that on the surface it would be fairly simple.
17 And the reason I say that is because I think you could
18 basically test the cigarette smoke like you test cigarette
19 smoke for nicotine and for tars and particulate matter.
20 I'm not expert in cigarette smoking machines and I'm
21 not expert in how they do that, but I would think that the
22 basic idea of what you would do would be the same, is that
23 basically, you would try to light up a cigarette and you
24 would draw out the smoke from that cigarette and try to
25 contain that cigarette smoke in some type of enclosed space
26 that didn't get contaminated, and then would you analyze

it.
27 And I think the other thing you would do, like in any
28 scientific experiment, is you use controls. And if you

1 wanted to compare cigarettes, one that, say, had a filter
2 that contained asbestos versus one that did not have a
3 filter containing asbestos, you would do the same experiment
4 using those two cigarettes, and then compare the results.
5 Q. Let me --
6 A. So I think that the basic design is fairly simple.
7 Now, I know from my own experimental work that basic designs
8 and sometimes what you end up doing are different.
9 Q. The first thing you would need, though, to do this
10 kind of an experiment is a reliable sample?
11 A. That's true, yes.
12 Q. You would need cartons of cigarettes with a known
13 history so that you could be sure they were representative
14 of the cigarettes that were actually sold and smoked during
15 the relevant time period?
16 A. I would agree with that. You would have to know that
17 the cigarette in question was the one that was being
18 analyzed, yes.
19 Q. You would want to quantify and to measure any changes
20 in the cigarettes you were using in the experiment to
21 determine whether they were substantially similar to the
22 cigarettes that were sold and used during the relevant time
23 period?
24 A. You would want to do that. Whether that would be
25 possible to do is another question.
26 Q. And gross visual observation would not be a sufficient
27 basis from which you could conclude that the cigarettes you
28 were going to use in your experiments had not changed over

1 time?
2 A. I think that's probably true. What you'd really want
3 to do, I guess, in something like that, would be to get the
4 manufacturer's specifications for what they said the
5 cigarette filter had in it, and then compare that with what
6 the cigarettes you were going to test had.
7 I mean, I would suspect that the manufacturer knew at
8 the time they made the cigarettes exactly what the
9 specifications were with respect to what they had in it, and
10 that you could compare what they said versus what was
11 present in the cigarette you were testing.
12 If there were gross differences, if you felt there was
13 deterioration, or things like that, you probably wouldn't do
14 the test or you would assume that there could be a chance
15 that the data would not be accurate?
16 Q. Such a study, such an experiment would require a

smoking machine, wouldn't it?
A. That's what I would assume that would be used, but like I said, I'm no expert in smoking machines.
Q. And you would want to test the cigarettes against control cigarettes?
A. I've already said that, yes.
Q. And you would want to use ten different types of cigarettes with ten different types of filters, wouldn't you?
A. You would certainly want to have a good control with as much variability as you could, to see if the one that you were testing, that you suspected had crocidolite in it, was

the only one in which you got a sample of smoke that did have crocidolite.
Q. And you would want to conduct the experiment in what is called a double blind fashion so that researchers involved would not know which type of cigarette or which type of filter they were working with?
A. I would agree with that, just like the carotene experiment.
Q. And, in fact, that's what you do in the work you do?
A. That's right.
Q. And you'd want to code the data so that any bias or interest on the part of the researcher could not affect the results of the experiment?
A. That would be the best way to do it, but you also are trying to imply, I think, that when somebody doesn't do it that way, that they might not be telling the truth, and I don't think that's necessarily correct.
Q. That's not my intention at all, Doctor. All I want to know is whether, if you were going to do an experiment like this, you would want to code the data so that any bias or interest on the part of researcher could not affect the results of the experiment?
A. Fair enough.
Q. And you would also want to design a protocol for that study -- tell me what a protocol is.
A. A protocol is just a way that you would go about doing a certain study. You'd have certain things that you wanted to do in an a certain order, and the order in which you'd do

those things would be indicated in that protocol, depending on what you wanted to answer, what question you wanted to answer.
Q. And you'd need to know more than just whether or not there was asbestos in the smoke, you'd want to know whether it could be deposited and retained in the lungs of people who were exposed to that smoke?
A. As I think I said in my deposition when you asked me that question, that certainly is the bottom line in all of

this, and that's something that will eventually be known, because it will unfortunately have to be tested, and that will be the most important of all the things to determine if that type of asbestos is present in the lungs of an individual, say like Dr. Horowitz.

Q. And the reason you need to know that is because in order to cause disease, asbestos fibers have to be a certain size and a certain shape?

A. Well, they basically have to be a certain size and a certain shape to get to the lungs. Once they are in the lungs and are at that location, I'm not sure yet if that matters or not, but they have to be that size and shape to get to the lungs.

Q. Well, they have to get to a certain part of the lung?

A. They have to get to a certain part of the lungs. We are not certain whether they absolutely have to reach the pleura or not, but that's what we assume they probably do.

Q. It's not just enough to inhale asbestos or any other type of dust for it to have the potential -- for it to cause

disease. A number of other things have to happen once you inhale it; isn't that right?

A. I think you've already said what has to happen, which is what I said, that that asbestos, like I showed in the picture, has to get to the region of the respiratory bronchi alveolar duct where it's deposited, and then can cause the adverse reactions that it does.

Q. The first thing that has to happen is that you not exhale it?

A. Well, I don't know if it's quite that simple, because when you are working in an industrial environment, you're always exhaling and you're inhaling, and you're exhaling the dust all the time, so there's not ever a situation where you can inhale and then not breathe anymore. You're always inhaling or exhaling, whether it's a dusty room or a dusty garage, or whatever.

But basically, you have to get the asbestos to the region of the lung where it can potentially cause injury.

Q. And fibers have -- you have to do something more than just inhale them, you have to inhale fibers at a respirable dimension before they can cause disease?

A. Right.

Q. And unless a fiber is of that respirable dimension, it can't cause disease?

A. It usually will get caught up and will not ever reach the area where it can cause potential disease, and that's what's meant by respirable fibers. They are a certain size and shape where they can get to a region of the lung where

they can cause disease.
Q. And that size and shape, what we are talking about is length and width?
A. Right.
Q. And we are talking about single fibers, not bundles or clusters and aggregrates of fibers?
A. Again, it's not that simple. Either some of them are in bundles and aggregates, and those usually get caught up. The ones that are in single fibers are the ones that usually get into the peripheral lung.
MR. OHLEMEYER: Your Honor, this is a deposition in this case July 15th, 1995, page 42.
MS. CHABER: Could you give me line numbers?
MR. OHLEMEYER: Page 42, line 8.
Q. Do you recall me asking --
MS. CHABER: Can you wait, please.
MR. OHLEMEYER: Q. Do you recall this question, Doctor, and this answer at your deposition? Actually, I'll start at line 4.
"To create the potential for disease, exposure has to involve a sufficient exposure to respirable fibers," and your answer was: "Fair enough."
And my next question was: "And that is because structures or aggregrates of fibers are not generally of a size and of a shape that allow them to get to the portion of the lung that they could produce mesothelioma," and your answer was: "That's correct."
A. Yes.

Q. And that is correct?
A. That's what I just said.
THE COURT: Ladies and gentlemen, the deposition is a taking of the testimony of a witness outside of the presence of the court. It's given under oath. Questions are asked and answers are given. And the answer is given under oath, as I indicated, and it has the same value as if you heard it here directly. It's just recorded and it's used for a variety of purposes during the course of the trial.
MR. OHLEMEYER: Q. Dr. Hammar, the body, as you have told us, has defense mechanisms and clearance mechanisms to deal with inhaled dusts, including asbestos?
A. True.
Q. And you said something about the nose and the mouth. The size of dust particles that are cleared or filtered by the nose, as compared to the mouth, really doesn't make much of a difference as it relates to these respirable single fibers we just talked about?
A. Not as much. The respirable fibers, the ones like we've already talked about, are the ones that have the size that potentially can reach the airways because they are

not
22 hung up elsewhere.
23 Some of the respirable fibers are going to be
cleared
24 or not reach the airways. Just because they are
respirable
25 doesn't mean they have to reach the outer lung. A lot of
26 them don't. They are also caught up in the mucus, or
27 whatever, on the hairs of the nose, and that's to be
28 expected.

1 Q. Or they get trapped at the T that you drew this
2 morning where the airways split?
3 A. That's called the crina, (phonetic) yes.
4 Q. Deposited in the upper lungs?
5 A. Well --
6 Q. Upper airways?
7 A. Yes, in the upper areas. There's never been any
proof
8 that there's more asbestos in the lower lobes than the
upper
9 lobes in people who are exposed occupationally. There's
10 just the same concentrations. That's been documented by
11 Dr. Churg and Dr. Dodson.
12 Q. And some investigators have suggested that the
body's
13 clearance mechanism works so well, that 98 to 99 percent
of
14 all inhaled dusts are removed from the body before they
15 create a risk of disease?
16 A. That's true, yes.
17 Q. And once a dust is inhaled and even an asbestos
fiber,
18 it can be entrapped or cleared by the body's defense
19 mechanisms?
20 A. It can, and most of the lung fibers are not clear,
21 they are actually coated with the asbestos -- with iron
and
22 protein become asbestos bodies, which are thought to be
23 nontoxic. The problem is, is that the body can never coat
24 all the fibers. There is some clearance of the
amphiboles,
25 and there's a great deal of clearance of chrysotile.
26 Q. And there have been studies that suggest that up to
27 two thirds of asbestos fibers either get trapped in the
28 large airways or never make it to the lung?

1 A. That's fair enough, yes.
2 Q. And, of course, if an inhaled dust doesn't make it to
3 the lung, it can't cause or contribute to cause
4 mesothelioma?
5 A. That's true.
6 Q. And in one of those studies after a month,
7 three-fourths of the remaining one-third of the inhaled
8 fibers had been cleared or eliminated from the lung?
9 A. That's with chrysotile, and most of the chrysotile
10 is -- it's actually cleaved, broken down. Some people say
11 the magnesium is leached out of it and that's cleared.
12 That's not true for crocidolite and amosite.
13 Q. Cigarette smoke actually contains particulate
14 matter --

15 A. It does.
16 Q. -- moisture, tar droplets, that make it unlikely, if
17 not impossible, for asbestos structures in that type of
18 smoke to be deposited or retained in the lung?
19 A. I don't know if I understand what you're asking.
20 MR. OHLEMEYER: This is the October 19th deposition,
21 Your Honor.
22 MS. CHABER: In what case?
23 MR. OHLEMEYER: This is October 19th, 1994. I gave
it
24 to you.
25 MS. CHABER: What page, line?
26 MR. OHLEMEYER: Page 87, line 18.
27 MS. CHABER: Your Honor, the Doctor said he didn't
28 understand the question that counsel was asking. I don't

1 think there's anything --
2 MR. OHLEMEYER: I'll ask it again.
3 Q. Is there anything about cigarette smoke -- there is
4 something about cigarette smoke, is there not, Doctor, that
5 might inhibit respirable or the inhalation of any asbestos
6 fibers in that smoke?
7 A. I guess that's potentially possible.
8 Q. And that's because cigarette smoke has particulate
9 matter and moisture in it; is that right?
10 A. Well, it does have that. I'm not sure that's
related
11 to the effect on asbestos. It's my understanding that
12 cigarette smoke affects the clearance of asbestos. It
does
13 so in the peripheral lung tissue, and as just reported by
14 Dr. Churg, does so in the upper airways or in the
bronchial
15 tubes itself.
16 Q. The particulate matter in cigarette smoke has the
17 potential to affect the aerodynamic dimensions or
properties
18 of asbestos and prevent it from becoming deposited in the
19 lung?
20 A. I think that would be possible, yes. But if you
21 overwhelm the system, I'm not sure what difference it
would
22 make.
23 Q. Back to the experiment we were talking about,
Doctor,
24 that you would design. You'd want to measure the
25 concentration of asbestos, if any, in the lungs of --
26 perhaps in your experiment you used animals who were
exposed
27 to the smoke; right?
28 A. You could do it that way, yes.

1 Q. And in order to determine whether the results of
these
2 experiments were due to something more than chance or
3 something more than a random occurrence, you'd want to take
4 the data and examine the confidence intervals and the P
5 values to make sure it was statistically significant?
6 A. Well, yes, you would do that.
7 Q. Now, the fact that an experiment gets published in a
8 journal does not, without more, establish that it's a

reliable or valid scientific experiment; isn't that right?
A. I guess it doesn't establish that for certain, but I think we've already gone through what you talk about, peer review. And I guess if I was a reviewer of an article and I didn't think it was valid for some reason, I would say that:
This is not valid, and that the person who was trying to publish this should go back and do the experiments correctly or differently, to satisfy those potential limitations.
Q. Well, the key to examining an experiment like that, as you said, I think, whether it's published or not, is to look at the materials involved and the methods involved; right?
A. The materials and methods are a very important part of the paper, yes.
Q. And would you want to be supremely critical of the methods involved in order to determine if they were objective and the results were accurate measurements of what was intended to be studied?
A. I'm not sure what "supremely critical" means. I think you always are concerned that when a person does an experiment, that the materials and methods that are being

used would be done in such a way, or would apply to the experiment, that the results would be accurate and that they could be interpreted the way the author thought they should be interpreted.
If, for some reason, that was not the case, then you would want to tell the author that you don't think that their methodology that is being used to perform such an experiment was acceptable, and that they should go back and do certain things to change that or to answer the questions that you had.
Q. If the experiment was not reproducible, it would not be scientifically valid?
A. Well, reproducibility is precision, and that always has to be done. And the precision that is necessary is, again, a statistical type of thing, and you would have to do the experiment in such a way that it would satisfy statistical analysis.
Q. I think the answer to the question was yes, but let me ask you again. If the experiment was not reproducible, it wouldn't be scientifically valid?
A. That's fair enough, yes.
Q. Now, if an experiment like that were submitted to a journal to be published and it were rejected by a journal, you'd want to know why, wouldn't you?
A. You mean if I was reviewing the paper -- first of all, I'd never know if it had been rejected by another journal. And I guess if I was reviewing a paper, I wouldn't necessarily care what the other reviewer thought, as long as

I felt that I was capable or qualified to review that type of paper.
It's always nice to know what other people think about other people's work, but yet, there can be built-in biases on that regard, as well. Papers can be rejected from medical journals for not criticizing scientific content, but because of other reasons that -- I'll say political reasons, personal reasons, et cetera, but you would be concerned about that.
Q. Now, the experiment, Dr. Longo's experiment, used nine cigarettes from one 40-year-old pack; isn't that right?
A. Fair enough.
Q. And the history of those cigarettes and the conditions under which they were stored and where they had been from the time they were manufactured until the time they came into Dr. Longo's position is unknown?
A. I don't think that's what he says in here. Maybe I interpret this different than you do.
Q. Well, let me ask you to assume that the history of those cigarettes and the conditions under which they were stored over the 40-plus years since they were manufactured is unknown.
Would that have an effect on your opinion as to whether he had a reliable sample to use in this experiment?
A. I'm sorry, could you ask that again, please?
Q. Sure.
Let me ask you to assume, Dr. Hammar, that the history of the cigarettes used in this experiment, the conditions

under which they were stored, where they had been for the 40 years between the time they were manufactured and the time Dr. Longo obtained them, if all of that were unknown, would that have an effect or might that have an effect on your opinion regarding the reliability and representativeness of the sample used in this experiment?
A. I guess that's potentially something that could alter the reliability. I don't know if there would be any way to know that.
Q. This experiment didn't use a smoking machine? It didn't use an automated smoking machine?
A. I thought it did. Maybe not an automated one, but the way he says it in here: Because of the contamination problem we countered using the conventional smoking machine, a piston-type smoker was designed to smoke cigarettes and collect smoke particles, and it seems to me that that's a smoking machine. It may not be the standard one that is used, but that's what he said of his materials and method.
Q. Let me ask you to assume, Dr. Hammar, that the smoking machine Dr. Longo used was a 30 milliliter BD syringe that

was operated by hand.
A. That's what he said.
A. The smoker consisted of a modified, new 30 ml syringe,
and he gave the company that produced it, Becton Dickinson.
Q. And my question is: That's not an automated analytical smoking machine?
A. It isn't, but the reason he didn't use that was because of what he said.

Q. And the experiment wasn't conducted in the double blind fashion?
A. No.
Q. And the data wasn't coded in any way?
A. No.
Q. And Dr. Longo new exactly what he was looking for when
he did the experiment?
A. He did, but the important part of this experiment, the
way I read it, he did use the proper controls.
Q. And he was being paid by attorneys to do the experiment?
A. Well, I don't know if he was paid by attorneys to do the experiment or not. I never talked to him about being paid by attorneys. I talked to him about what he said as far as the experiment and what he found.
Q. Well, let me ask you to assume that Dr. Longo was paid
by attorneys to do the experiment. Would that have an effect on your opinions about the reliability or the validity of the data?
A. Not necessarily. I don't think that necessarily makes
something invalid.
Q. Is that something that you, as a reviewer for a publication, would want to know about a piece of manuscript
that was submitted to you?
A. I would be more concerned about the controls in the experiments like this than anything else, and the controls would be what you kind of mentioned or, basically, another cigarette that was analyzed, or hopefully more than another

cigarette that was analyzed.
With respect to the payment thing, I think that's nonsense. And the reason I say that is that there has been research funded by the federal government that's been plagiarized, that's been falsified, that's been really totally dishonest that has been published in very prominent medical journals, including the New England Journal of Medicine.
So just because somebody is paying him to do something
doesn't necessarily mean that it's going to be valid or invalid. I think what the validity of it is, is going to be
determined by the person's own ethics and what that type of

13 a scientist he is and what type of a person that person is.
14 Q. And whether it was conducted in accordance with
15 standard scientific procedures?
16 A. Well, that is important. And the controls are
17 important. As far as the double blind thing, I don't know
18 if it would be possible to do a double blind. I guess, in a
19 way, the ideal situation would have been for somebody to
20 have taken a mixture of cigarettes and have coded them and
21 not told Dr. Longo which one was which, and for him to do
22 exactly the same experiments on these individual cigarettes,
23 come up with the data, and then compare that in a blinded
24 way and see what it was. That would be the ideal situation.
25 Q. The experiment didn't make any attempt to determine
26 whether the moisture in cigarette smoke or the presence of
27 tar, or any organic particulate matter, or any other
28 principles of smoke chemistry might have inhibited or

1 prevented the release of asbestos from those filters?
2 A. It didn't do that but again, I think the controls he
3 used would partially compensate for that. At least, that
4 would be my opinion.
5 Q. And the experiment didn't include any study to
6 determine whether the asbestos that may or may not have been
7 present in the smoke was deposited or retained in lung
8 tissue?
9 A. That's the unknown that we have at this point in time.
10 And that will be probably the final piece of data that will
11 be the most important thing to determine, whether or not the
12 crocidolite asbestos gets into the lung tissue of people who
13 develop mesotheliomas thought to be caused by this.
14 Q. And as we speak, you don't have any information or any
15 basis to say, with reasonable certainty, that based on what
16 Dr. Longo finds, you can conclude that that would result in
17 a significant level of asbestos in somebody's lungs?
18 A. Maybe not on an absolute reasonable certainty, but
19 certainly my gut reaction as a scientist and a pathologist,
20 what I know about this type of thing is that I think there's
21 a very good chance that the asbestos in that smoke will get
22 into a person's lung, and it will be deposited in their lung
23 tissue. I can't prove that at this point in time, but
24 that's what I happen to believe.
25 Q. And that essentially, I think, as you described it
26 right now, is your best guess?
27 A. That's my best guess and that's what I think, based on
28 my experience as a pathologist is what will be observed

and

what will found out to be the case.
Q. But you have no pathologic or experimental evidence of
that?
A. I don't have any evidence myself of that at this point
in time.
Q. Now, let me ask you to assume a few things, Dr. Hammar. Assume that --
THE COURT: Could I interrupt you?
MR. OHLEMEYER: It's a good point.
THE COURT: We will take the afternoon recess at this
time for fifteen minutes until 3:20. Please come back at that time. Remember that you're not to form an opinion about the case and you are not to discuss it with anyone. If anyone attempts to discuss the case with you in any way,
advise the court of that fact. 3:20, please.
(Recess taken.)
THE COURT: All the jurors and everybody else are present, so you may resume cross-examination.
MR. OHLEMEYER: Q. Just a few more, Dr. Hammar, and
let me tie up a few loose ends on this Dr. Longo experiment.
A. All right.
Q. Has Ms. Chaber showed you the photographs Dr. Longo took of his experiment?
A. I didn't see those photographs. The photographs I saw
were published in this article.
Q. Has she shown you the videotape of the experiment?
A. No.
Q. Have you seen any of the raw data from the experiment?

A. I have seen some of that.
Q. Where have you seen that?
A. I was given that by another attorney.
Q. Do you know anything about the physical dimensions of the structures that Dr. Longo claims to have observed in the
smoke?
A. That's given in the paper.
Q. The length being greater than five microns?
A. Right.
Q. But there's nothing in there about the width, is there?
A. Let me check. As far as I recall, there was not.
Q. And do you know --
A. Wait a second. It's unclear. He refers to a statement that's on page 2233 of the article, quotes: On the basis of a fiber length of five micrometers, the diameter is 0.1 micrometer, and I don't know if that's what
he measured or that's what he assumed.
Q. Do you know if he counted single fiber as opposed to structures of fibers?

A. He did not count single fibers, but he did indicate
--
I'll see if I can find exactly where that is. He talked
about in the discussion that he said: Overall, 18.7
percent
of the structures, that's the crocidolite structures,
observed are aggregrates rather than individual fibers.
And
I don't know if that means that the rest of them are
individual fibers or not, but he said 18.7 percent of the
structures were aggregrates.

Q. But you haven't gone back to look at the data to make
a determination as to whether those were structures or
whether those were fibers, whether they were greater than
five microns and how wide they were?
A. I did go back to the data. I couldn't tell from the
data that I had what they were. What this article says in
that discussion, that 18.7 percent of them were aggregrates
rather than individual fibers. Now, if that means then 100
minus 18.7 is what are individual fibers, which I would
kind
of --
Q. But don't know if that what that means?
A. No, but that's what that implies. If that's
correct,
and he does indicate what percent were greater than five
micrometers long, and he does cite the Stanton article
about
the Stanton hypothesis and the Pott hypothesis about the
longer fibers being more common in mesothelioma.
Q. You agree, won't you, Doctor, that there is probably
asbestos in everybody's lungs?
A. Some asbestos in most people's lungs, yes.
Q. And asbestos is a naturally occurring mineral in
some
parts of the world?
A. It is.
Q. It's been used in a variety of products and
construction materials?
A. That's correct.
Q. And there is a level of exposure or a level of
asbestos in people's lungs that has been studied?
A. True.

Q. By yourself?
A. Yes.
Q. By others?
A. Yes.
Q. All over the world?
A. Pretty much so.
Q. And there are some values that you can derive for
what
you might expect to find in the lungs of people who don't
have occupational exposure to asbestos?
A. Yes.
Q. And exposure to asbestos at that level is not
believed
to cause or contribute to cause asbestos-related diseases?
A. That's generally thought to be the case, yes.
Q. And not every exposure to even respirable asbestos

fibers is capable of causing disease; is that right?
A. I think every exposure does not end up with disease. In fact, in the minority of people who are even exposed occupationally to asbestos get a disease. So not every respirable asbestos that one is exposed to causes disease. There's no doubt about that. I would say that potentially, it's capable of causing disease. Whether it does or not is a whole different thing.
Q. There are scientists, there are researchers, there are pathologists such as yourself who believe that there is a threshold level of exposure to asbestos below which there is no risk of developing disease?
A. That's right. And I've always said myself in any case I reviewed that if it's below what is considered normal, I

would not relate a disease to it.
Q. And what you take issue with is not the ideas of a threshold, you just have a hard time trying to figure out where it is?
A. Well, what bothers me is that there is a genetics variability and how one reacts to certain types of agents; carcinogens, specifically. If everybody that smoked cigarettes got lung cancer -- that would be horrible -- but the question really there is why doesn't everybody get lung cancer who are exposed to exactly the same carcinogens, so there has to be some individual susceptibility.

What bothers me or what I am concerned about is that there are certain individuals, because of certain reasons that are probably based on very distinct cellular mechanisms, some of which we understand, some of which we don't, that accounts for this.

And I just wonder that there might be some individuals who are much more susceptible to the tumorgenic effect of asbestos with respect to mesothelioma than others. And that's what maybe accounts for the variability in incidence.
Q. Let me make sure I understand. You don't take issue with the idea that there is a threshold. It's just that you're not sure whether it can be applied to everybody or whether or where the line can be drawn to say: Here is the threshold?
A. That's fair enough, yes.
Q. There are researchers, epidemiologists, pathologists, who have studied the issue and drawn a line?

A. They have drawn a line and, as I've told you in deposition, is that I would never attribute an asbestos-related disease in a person who was below that threshold, and that includes mesothelioma even though, in my own mind, I am uncertain whether that's correct or not.

But if I had a case, for example, of a mesothelioma

that occurred in an individual, and we had a lung tissue to perform asbestos digestion analysis on it and I found a concentration of asbestos that was below background, I would not attribute that mesothelioma to asbestos.

Q. The line they draw can be expressed two ways. One is you can look at it from the exposure point of view, how many fibers of asbestos in a cubic centimeter of air do you need to be exposed to over a certain period of time --

A. That's been done, yes.

Q. -- or you can come at it from the pathological perspective, how much asbestos is there in the lungs of people who have asbestos-related disease?

A. That's correct.

Q. And the former, the exposure, the fiber per cubic centimeter is not really your area of expertise?

A. That's correct.

Q. But the fiber burden is something you do?

A. That's correct.

Q. And fiber burden is the more reliable, in your opinion, method of determining whether asbestos caused or contributed to cause a disease?

A. I think it is, with the caveats that I've already

mentioned about we might not be testing the right tissue.

Q. And in this case, there is no fiber burden evidence?

A. That's correct.

Q. Now, a couple of questions, Doctor, about Plaintiffs' 12, 11 and 13.

When a laboratory prepares a water sample or an air sample to analyze it under the electron microscope --

A. Yes.

Q. -- are there certain procedures that you follow to account for or consider the possibility of laboratory contamination?

A. Yes.

Q. What do you do?

A. Well, you basically test all of your reagents that you use in analyzing the specimen. For example, if you have an air specimen and you want to suspend it in some type of solution, you, of course, have to make certain that the solution that you're going to examine does not have asbestos in it. You have to make sure that any water or any other solvent that you use to suspend something in does not have asbestos in it.

You have, basically, controls for every type of reagent that you use to make sure that that's asbestos free, or if it isn't asbestos free, you have to take that into consideration in any calculation you do.

Q. And when you say "controls," do you mean a simultaneous or a contemporaneous controls?

A. Two controls. First thing that a laboratory does is

when they do fiber analysis or asbestos body analysis is

making sure your reagents don't, for some reason or other, have apparent asbestos in it.
Q. When you say reagent, you mean the equipment and materials in your laboratory --
A. I was thinking more of the solutions.
Q. -- that you use to prepare the sample?
A. Right. And, for example, there's certain parts of, in the country, for example, in Northwestern Washington up by Bellingham that there's a very high level of chrysotile asbestos in the water.

And if you were going to do an analysis for chrysotile asbestos and some of the formalin that you made was from water that was contaminated with asbestos, you sure as heck wouldn't want to make a mistake by saying: There's all this asbestos in this sample when, in fact, all of it came from the water.

So what you have to do is make sure that the reagents you use and the various techniques you use that you know what type of asbestos background could be potentially possible from those techniques, and you have to take that into account and hopefully, you have to actually eliminate those so that you don't have any misinformation.
Q. And one way you can do that is to run a contemporaneous control, prepare a sample with all the same material, except what it is you've collected to look at, and see if there's anything in there that should or should not be there?

A. Right. You always should do controls when you're doing a type of experiment, when you're comparing one thing versus another.

And you still have to have controls when you, again, are trying to analyze something for a specific substance, making sure that something else that you happen to use in preparing this material is noncontaminated.
Q. What you do also is take a blank, take a sample of the air in your laboratory?
A. A blank sample, yes.
Q. Thank you, Doctor. That's all I have.
A. Thank you.

CROSS-EXAMINATION BY MR. BRAKE

MR. BRAKE: Q. Doctor, I'm Stephen Brake, and I represent Hollingsworth and Vose. I think I just have a couple of things.
A. Okay.
Q. You had told us this morning about a group of asbestos related diseases; do you remember that?
A. Yes.
Q. And you mentioned laryngeal cancer?
A. Laryngeal carcinoma.
Q. Dr. Horowitz, he doesn't have that; right?
A. He does not.
Q. And you told us there was a controversy about

laryngeal cancer?
A. I said there was a cancer with respect to laryngeal cancer, gastrointestinal cancer, and kidney cancer with

respect to whether asbestos causes an increased incidence of those diseases.
Q. By that, you mean there's a controversy among scientists as to whether asbestos in fact causes those cancers; is that what you mean?
A. Most of the controversy is epidemiologic studies and the scientists involved in that.
Q. Some scientists think it does based on studies and some scientists think it doesn't; is that fair to say?
A. I don't know if it's quite that simple. The majority of studies, I would say, have suggested that asbestos can cause those cancers in people who have high concentrations in their lung tissue, and when you don't have high concentrations, it does not.
Q. The controversy is not everybody agrees; is that right? It was your word, that's why I would like you to explain what you meant by controversy?
A. The controversy is that some people have found different results from the studies they have done, and partly that is due to the various concentrations of asbestos that they can be exposed to.
I would say for gastrointestinal cancer, for example, the current standard that is used, that if a person has a concentration of asbestos in their lung tissue great enough to cause lung cancer and has a gastrointestinal cancer, then that cancer is probably related to asbestos. But if they don't meet that criterion, it is not.
Q. And Dr. Horowitz, he doesn't have gastrointestinal

cancer, either, does he?
A. He had colonic adenocarcinoma in 1971. I don't think it is related to asbestos. He does not have any evidence of recurrence of that disease.
Q. And he doesn't have kidney cancer?
A. He does not.
Q. As to the benign conditions you told us about, visceral pleural fibrosis, that was one of them; right?
A. Yes.
Q. He doesn't have that, does he, as far as you can tell?
A. That's a very difficult diagnosis to make, except at autopsy or at surgery, and he doesn't have any radiographic evidence of that.
Q. Pleural plaques we talked about a few moments ago; right?
A. The pleural plaque thing I think is an issue of uncertainty. I think there was a suggestion in one of CT scan reports, and in the other one that Mr. Ohlemeyer showed

me, indicated that they didn't see that structure.
Q. Really you'd have to have a radiologist look at the CAT scans?
A. I think it's more that than a radiologist looking at a CAT scan. I think what you have to make certain is the CT scans that were done were done in the same way so you examine the same part of the body.
Q. There was something round adelectasis?
A. Yes.
Q. Is that a disease?

A. It is.
Q. He doesn't have that, does he?
A. No.
Q. And asbestosis?
A. Right.
Q. As far as we can tell, he doesn't seem to have asbestosis, does he?
A. There is no radiographic or pulmonary function evidence of asbestosis.
Q. And with someone who's still alive, those are the two things you look at to see asbestosis, isn't it, radiographic evidence and the pulmonary function?
A. That and physical examination for the presence of velcro rales.
Q. And as to pleural effusions, he's had some pleural effusions?
A. He has.
Q. Lots of things that cause pleural effusions?
A. Well, lots of things can, but when he presented initially in March of 1994, he had pain, and then by June of 1994, he had a pleural effusion that increased in size.
There are many things that can cause pleural effusion. It's not specific for mesothelioma or asbestos. Infection can do it, all kinds of things can do it.
Q. And people with mesothelioma, do they commonly have pleural effusions?
A. I would say over 90 percent of them present with pleural effusions.

Q. There was some questions put to you about the different fiber types and their disease causing potential. I just wanted to touch on one point with you, which is: That as far as you're concerned today, your view is that there's really a good chance that the disease-causing potential of these three fibers is really about the same?
A. They might be very close to the same, and the reason I say that is because there have been published, in the last year or two, more articles of mesothelioma occurring in individuals who are exposed to chrysotile, and there's also one paper that's been put out that has stated that one person believes that crocidolite is only about two times as toxic as chrysotile. And I've said the only way we would

ever do that is to do human experimentation, which is unacceptable.
Q. So this notion that you can say crocidolite has a toxic level of ten and amosite somewhere in the middle, and then chrysotile at the bottom of one or two, you don't agree with that currently, do you?
A. At the current state of knowledge, I do not agree with that. I don't think it's known exactly, and I don't know if there's any way to ever compare the toxicity in humans, but I don't agree with that. I think they may be closer to the same.
Q. You were put some questions this morning about how long it takes mesothelioma to develop. Do you remember that?
A. Yes, I do.

Q. And then you compared it to lung cancer for us?
A. Yes.
Q. The doubling times, and that sort of thing?
A. Right.
Q. In fact, with respect to mesothelioma itself, we really don't know for certain when it appears in any given individual, do you, Doctor?
A. We really -- we don't for certain. What has been observed is that the earliest stage of the disease is thought to be small nodules on the parietal pleural surface.
How long those nodules had been there when they are discovered is not known.
What is known is that if you look at doubling times and lung cancer, that it takes a cell 10 micrometers in diameter, 10 to the 10th doublings to produce a nodule one millimeter in diameter.
Q. You don't assume the doubling time is the same for mesotheliomas for lung cancer?
A. I don't know what the doubling time for mesothelioma is. If you assume that it's similar to lung cancer, the range would be anywhere from 3 to 400 days. The average doubling times in most nonsmall-cell lung cancers is in the neighborhood of 100 days.
Q. Here's my question, Doctor: Do you, as a pathologist, in the exercise of reasonable scientific certainty, do you assume the doubling time for mesothelioma is the same or similar to that of lung cancer?
A. Not necessarily, no.

Q. And, in fact, let's take Dr. Horowitz, who presented with what you've diagnosed as mesothelioma sometime in 1994; does that sound correct?
A. June of 1994, first symptoms in March of '94.
Q. Can you say, with reasonable scientific certainty, when he first had mesothelioma?

A. Scientific certainty, like more likely than not or with 100 percent certainty? I'm not trying to ignore that question, but I'm not sure what "scientific certainty" is.
Q. As to any given individual -- let's make it easier -- as to any given individual, you really can't tell us with certainty, medical certainty, when they first got mesothelioma, can you? And I'll make it easier, because you really don't know the doubling time.
A. It's more than the doubling time. Are you saying exactly at what point in time the first cancer cell occurred?
Q. Sure, let's take that one.
A. No, I can't say that with certainty. But what you can do is if you look at all other kinds of cancers and look at the doubling times and assume that mesothelioma is going to be within the range of those other cancers, you then could say on a more likely than not basis, in my opinion, which is 51 percent or greater, that the majority of mesotheliomas have been in existence for years at the time they are first diagnosed clinically.
Q. For how many years?
A. That's what's harder, and I would say -- I really don't know. I would say as long maybe as 20 years, as short maybe as one year. I really don't know.
What I have seen myself in Bremerton is that I have seen some people who have -- I've gone into the operating room and looked at their pleural cavity when they have persistent pleural effusions and have only seen a slight thickening on the tissue, but on biopsy in situ have invasive mesothelioma. And in a year that person, his chest was totally obliterated by a tumor.
But I've seen other people with the exact opposite is the case, where they have a few nodules and five years later they are exactly the same.
Q. Have any of the lawyers you've worked with on asbestos litigation in California explained to you that there's some legal significance to the question of when the cancer first appears?
A. That issue was explained to me a few years ago. I haven't heard much of an explanation in the last few years.
Q. You relied on Dr. Longo's articles in giving your opinions today?
A. I did, yes.
Q. And you yourself, you've written something on the order of 80 articles in the peer review literature?
A. Yes.

Q. And Dr. Longo's article, do you have that in front of you?
A. I do.
Q. On the first page?

A. Yes.
MS. CHABER: I'm going to object, Your Honor, and ask for a sidebar on this issue.
(Sidebar conference.)
THE COURT: The jury is ask relax for a few minutes. We will have to go into chambers.
(In chambers outside the presence of the jury.)
MS. CHABER: Your Honor, where I believe Mr. Brake is going is the first statement in the footnoted area here that says: "The costs of publication of this article were defrayed in part" -- stop me anytime if I'm wrong, Mr. Brake. Is this where you were going?
MR. BRAKE: Yes, the first two paragraphs I'm going to call attention to.
MS. CHABER: I don't care about the second one.
The costs of publication of this article were defrayed in part by the payment of page charges. This article must therefore here be marked advertisement in accord with 18 US Code Section 34, solely to indicate this fact.
And the reason I object to that, Your Honor, is because I think it's argumentative. I think it's a legal issue as to whether or not the publication has to put that, and I think that it's going to create a side issue and require me to bring in the editor of Cancer Research magazine, who faxed this statement that:
"This statement confirms our conversation regarding the statement," and it's the statement I just read, "that appears at the bottom of most articles in Cancer Research.

As we discussed, this statement in no way negates the extensive peer review process to which submissions are subjected. It refers only to the fact that authors of published articles, except for letters to the editor, special lectures, et cetera, are required to pay approximately $65 per page to help us offset the ever spiralling costs associated with publishing the journal."
I believe that the implication that counsel is trying to leave is that somehow, Dr. Longo paid to have this article published. I think that it creates a side issue, I think it's argumentative, I think it calls for a legal conclusion as to what the journal is required to do or what they perceive they are required to do if they charge page charges, and it requires me to then have to rebut testimony by dragging out the editor of Cancer Research, which is located in Philadelphia, out here to get on the stand and say that: We do these page charges, we do it to all the authors; that it doesn't in any way have anything to do

with
19 whether the article is peer reviewed, whether it is accepted
20 along those lines.
21 And I think it should be kept out under 352 as more
22 prejudicial than probative and requiring -- and confusing to
23 the jury, and will require undue consumption of court time,
24 requiring me to drag in a witness to rebut the presumption
25 or the inference that counsel is trying to create from this.
26 MR. BRAKE: Your Honor, I think it goes directly to
27 the credibility of this. What it supposedly is, is a
28 scientific article. They paid, in part, to have it

1 published. The witness is going to tell me that that's not
2 uncommon these days, but he's not familiar with having it
3 marked as an advertisement.
4 And in his 80 articles he's published, none of them
5 have had to be called advertisements. I think if they have
6 to call it advertisement because they paid these people to
7 publish it, he can try to explain to me that, as undoubtedly
8 he will, that it's not as unusual as you might think, but it
9 does seem to me goes to the credibility of this article and
10 as to the bias, and I should be able to bring that out.
11 MS. CHABER: I'm not objecting to that. That's not an
12 issue. There the author -- this has nothing to do with the
13 author. This has to do with what the publication perceives
14 as their requirement under whatever this --
15 MR. BRAKE: You can take judicial notice of the
16 statute, if you want to bring the statute in to say it's
17 mandatory by law. It purports to be a scientific article,
18 and the law requires they call it an advertisement for
19 certain reasons because they took money to publish it. And
20 it seems to me that fact which goes to the credibility --
21 THE COURT: Is Longo going to be here?
22 MS. CHABER: Yes.
23 THE COURT: I think we can save it for Longo.
24 MR. OHLEMEYER: It goes to whether this is something
25 that can be reasonably relied on.
26 THE COURT: I don't think you can ask him about that
27 aspect. That opens up all kinds of things. I don't know
28 what it means on its face. You can ask him what he thinks

1 of it as a study and a report, and so on, and that's been
2 gone into.
3 MR. BRAKE: Can I ask him -- Your Honor, it seems to
4 me I should be able to bring -- I guess what I'm saying, I
5 should be able to bring it up. They are saying they relied
6 on this as a piece of scientific literature. It has to be
7 called an advertisement.
8 Ms. Chaber thinks she can explain that that's really
9 not so bad. Fair enough. Let her try to do it. And if
the

10 man is relying on a piece of literature and only this
piece
11 of literature to show this opinion is valid and it's
called
12 an advertisement by law, I should be able to call
attention
13 to that fact, is really all I'm saying.
14 MS. CHABER: Do you have the journal, counsel,
because
15 it says that at the bottom of numerous articles in the
16 journal, and that does not impugn the integrity of them.
17 THE COURT: It's a collateral issue.
18 MR. BRAKE: This witness said he has not seen it
19 before.
20 THE COURT: Told what?
21 MR. BRAKE: He's never seen it before, that it's
very
22 unusual.
23 MS. CHABER: He said it is not unusual to have page
24 charges. He said it is not unusual to have page charges.
25 MR. BRAKE: But he's never seen a scientific article
26 called an advertisement. It seems to me it goes to the
27 credibility, and I should be able to point that out.
28 THE COURT: I hesitate to bring all this up before
the

1 jury, but if -- I don't know what it means. And I think
2 that maybe it does test it, but I think that it raises a
3 collateral issue that we will have to go into, and if you
4 bring it up, and I suppose you could in a sense, but I
5 hesitate to take it before the jury if it could be avoided,
6 because it can be very time consuming. You ask him that,
7 and she wants to defends on it, which she has a right to
do,
8 if it impunes the authenticity of it or the reliability of
9 it, or whatever it does. I don't know.
10 MR. BRAKE: Is Your Honor ordering me not to ask
about
11 the advertisement? I propose to ask it.
12 THE COURT: If you propose to ask him, then it's
going
13 to open it up, and I think there ought to be some way to
14 avoid it before the jury, because I don't know what it
15 means. And that should have been resolved, I think
16 beforehand, if possible, but it hasn't been.
17 MS. CHABER: And neither do they know what it means,
18 but they want to create an inference.
19 THE COURT: Sure, of course it does. I understand.
20 MS. CHABER: It doesn't mean that. The editor,
Pamela
21 Grewbu, (phonetic) staff editor from Cancer Research, says
22 it doesn't mean that, and then I'm going to have to drag
23 this person out here to say that. I think it's perfectly
24 appropriate, when Dr. Longo is on the stand, if they want
to
25 ask Dr. Longo if he had to pay page charges to the
journal.
26 It's this --
27 THE COURT: Does it mean anything to this witness?
28 MR. BRAKE: Yes, it does, Your Honor. Here's what I

propose to ask him, that because in the left-hand corner, because of the payment of page charges, this article had to be designated as an advertisement.

THE COURT: Was he asked that in deposition?

MR. BRAKE: Yes. I discussed it with him.

THE COURT: What did he say?

MR. BRAKE: He says it says that and I've never seen it before. Page charges are aren't unusual, but --

THE COURT: It goes to his reliance on the article.

MS. CHABER: It doesn't.

THE COURT: Does it affect him?

MS. CHABER: He said it did not affect him; that page charges were something that were requested; that journals -- some journals can waive page charges. He said it did not.

MR. BRAKE: It goes to the credibility of his reliance. He's relying upon an advertisement when, in fact, he knows none of his own articles have had to be called an advertisement.

THE COURT: Does he rely upon it? Does that affect his opinion?

MR. BRAKE: So the question I can put is: Does it affect your opinion if this has been termed an advertisement under the law? That's fine.

MS. CHABER: Then we are getting into legal issues, Your Honor, that this jury is not appropriate to evaluate. This journal feels that they have to put that information there. It had nothing to do with Dr. Longo putting that information there, it had nothing to do with what was

presented in it, and it appears at the bottom of other articles in Cancer Research, which they say is not reflective in any way, but they feel that somehow they have an obligation. This is not an appropriate question of this witness.

THE COURT: It is, to some extent, if it changes his opinion, or --

MS. CHABER: He's already testified it doesn't.

THE COURT: They haven't asked that question.

MS. CHABER: But -- so it's like, let's see, somebody published that you beat your wife, and it says down here that you did that. Now, does that in any way affect your opinion about something else. They get to put the fact --

THE COURT: I know know, but --

MS. CHABER: And it's not probative of anything. If they want to ask --

THE COURT: As I said, you can respond to it if he deems that it's significant in asking it, then you answer it any way you want to, but I don't know what he has said changes his opinion or his reliance upon the article as to its authenticity or reliability, or whatever that he believes it is.

If he thinks it's a good scientific article, that it was appropriately made and all that sort of thing and it doesn't make any difference to him, fine. If it does, then they should know that.

MS. CHABER: But they know that already.
THE COURT: I don't know. He says that's important.

MS. CHABER: They are doing this in bad faith, Your Honor, because they know it has nothing to do with this witness' opinion. What they want to do is put extraneous fact before the jury that is an opinion of this journal that is not -- doesn't say that it is a requirement under the law. It's their opinion that it's a requirement of the law, and he wants to be able to stand up and says the law requires that we call this an advertisement.
MR. BRAKE: No.
THE COURT: It's a fact that somebody paid for the article to be published, apparently.
MR. BRAKE: That's correct.
MS. CHABER: And if he asks that question, are you aware that Dr. Longo had to pay page charges to get this article published, he can ask that question.
It's this language, Your Honor, where the journal, not Dr. Longo, where the journal is citing to this and interpreting some obligation that they have under the law to describe it as such, which they do in all of their articles, because they require page charges in there because they can't afford to put out the publication.
THE COURT: You can ask him if he read that and if that affects his opinion, and without disclosing that to the jury, and said that indicates that he paid for it, right, if that's what you want to do. I don't know if the magazine has said advertisement --
MR. OHLEMEYER: Under section 780, I think it is, any matter having any tendency to affects the credibility of

this man's opinion.
THE COURT: I understand, and it's his credibility, this witness', and you can ask him whether or not there's anything about that note that affects his reliance upon the article as being whatever it is, authentic to him or reliable reporting --
MS. CHABER: Without reading that note?
THE COURT: Without reading that note.
MR. BRAKE: I can call attention to the fact that it has to be marked as an advertisement, that's the important part, because he's going to tell me it's very unusual, he hasn't seen that before, and none of his peer review articles have to be --
THE COURT: Does he know the magazine?
MS. CHABER: Yes. He said that Cancer Research was a reputable magazine that requires page charges.
MR. BRAKE: That's all the more reason why I should be --
MS. CHABER: But the advertisement part of the --
THE COURT: I understand.

MS. CHABER: And I think under 352, Your Honor, it is more prejudicial than probative, because it gets into extraneous matters that require then subsequent rebuttal testimony to show what the journal's reasonable belief is as to why they had to put that there. Because now we are getting into what the journal's belief was.

MR. BRAKE: I'm losing track, Your Honor. The man testified it's a very reputable journal, and he's relying on

this article and he's satisfied with it, but he also told me at deposition he's never seen this characterization of advertisements. He has heard of page charges. It's not unusual. He only paid them once when he was young and, as he put it stupid, before he realized he didn't have to because "I'm an important author."

MS. CHABER: That's not what he said.

MR. BRAKE: I said stupid, because he doesn't mean he's just stupid. What he meant what is he didn't have to pay page charges, and they are very unusual, but I didn't see this before and it's very unusual. It goes to his bias in relying upon it so unabashedly. It's very unusual. None of his have been called advertisements.

And the fact he's willing to rely on something termed an advertisement goes to bias, and I think I should be given great latitude on the man's bias. This is their case, Your Honor. What happened is they went out and got this published, Longo and his friends, because they want to launder the test results, and we should be entitled to attack this article, is what I'm saying.

It shows bias for somebody to come in and say: Sure, I accept that, I rely upon it, because it's got a very unusual notation advertisement at the bottom. I think I should be able to get that out.

THE COURT: I guess you have to respond to it. I don't know. It seems to me that it does, to some extent, indicate the credibility of him and reflects on it. I guess you have to respond to it.

MR. BRAKE: Thank you Your Honor.

(In open court in the presence of the jury.)

THE COURT: We are all back together, and you may resume your cross-examination.

MR. BRAKE: Thank you, Your Honor.

Q. Dr. Hammar, do you have the Longo article?

A. Yes, I do.

Q. There's a notation in the lower left-hand corner by the footnotes, notes that Dr. Longo and his co-authors paid what are called page charges in connection with this publication of this article; correct?

A. Yes.

Q. And with respect to page charges, those are not terrifically unusual; is that fair to say?
A. That's fair to say.
Q. Some journals require those to help defray costs?
A. Many of them do.
Q. You've published over 80 articles in the peer review literature, haven't you?
A. Yes.
Q. And how many times have you paid page charges?
A. I don't know if I've ever -- well, I could say one time that I know for sure. Most of the time, as I think I said in my deposition, that when you order the articles and you pay for the reprints, you don't have to pay for page charges, but I don't know if I've ever paid page charges. It's very uncommon.
Q. Now, you notice in that notation it points out that

because of the page charges, they have to term it an advertisement. Do you see that?
A. Yes.
Q. That's pretty unusual, I believe you've told me, is that notation advertisement; have you seen that before?
A. I have not seen that personally before that exact designation.
Q. And have any of your peer-reviewed publications been termed "advertisements"?
A. No.
Q. Now, does it affect your reliance upon this article at all that it was termed an advertisement?
A. No. If anything, it makes me think that it's probably very accurate.
Q. And why is that, Doctor?
A. Because I mean if somebody was trying to divulge something that they didn't want somebody to know, they wouldn't put it down there in the first place.
Q. Before we leave Dr. Longo's article, just let me ask you: He recounts in there a test of nine cigarettes --
A. Right.
Q. -- done in 1991; correct?
A. Right.
Q. Does he say anything about testing three cigarettes on an automated smoking machine in 1994?
A. No.
Q. Do you know whether or not he did that?
A. I don't know, no.

Q. So you don't know anything about any results Dr. Longo may have obtained in 1994, do you, Doctor?
A. I don't.
Q. And when you gave your opinions today, you didn't base them at all on anything to do with any 1994 tests; correct?
A. No, they were based on this article and what Dr. Longo told me on the phone, which is basically what he said in this article, that crocidolite asbestos gets in the smoke

when these cigarettes are treated in this manner.
Q. Now, do you have your report you did?
A. I do.
Q. Today you listed all of Dr. Horowitz's asbestos exposures for us, one after the other.
A. Except I forgot the one on the transport ship.
Q. But you listed them all?
A. Yes.
Q. And the one you listed first was the Kent cigarette exposure; do you remember that?
A. Right.
Q. And then you went on and you told us -- I think your words were that was the most significant one?
A. I said I think in my opinion, that was the most significant based on what I had read in this article and what I understood his smoking history to be.
Q. Now, in your report on page 3, you list at the bottom of the page -- there's a carryover paragraph; do you see that?
A. Yes.

Q. You list all the exposures; right?
A. Right.
Q. Starting with the troop ship?
A. Right.
Q. Number two, the Hanna Pavillion?
A. Right.
Q. Number three is basement of his house in Cleveland?
A. Number.
A. Right.
Q. Number four, his home in Beverly Hills; right?
A. Correct.
Q. And number five, possibly the child study center in Los Angeles?
A. Right.
Q. And then last you list the Kent cigarettes; right?
A. Right.
Q. But today you came in and you listed it first; right?
A. Well, this listing right here doesn't imply in any way what I thought the most important was with respect to causing mesothelioma. It's simply a listing of what he was exposed to. I was asked the specific question, which is which of these I thought was most important, and I answered that question, which is my opinion.
Q. Now, but you reversed the order in the report today?
A. The report just simply lists the exposure he has. It does not in imply in any way which one I thought was most important. It doesn't say that in that report, and I didn't mean to intend that it did.

Q. In your report you didn't say that Kent cigarettes were the most important, most significant exposure, did you?
A. No, I didn't.

MR. BRAKE: That's all I have, Doctor. Thank you very much.

THE WITNESS: Thank you.

REDIRECT EXAMINATION BY MS. CHABER

MS. CHABER: Q. Dr. Hammar, on that letter report, did you write a cover letter that went -- actually, it's your first report, I believe. Did you write a cover letter that went along with the report --

A. I did.

Q. -- dated January 27th, 1995?

A. Correct.

Q. And that was something that was given to the defendants at your deposition?

A. Yes.

Q. And in that cover letter, did you indicate what was the most concern to you with respect to potential asbestos exposure in Dr. Horowitz?

A. I indicated that in the first paragraph, and I said out of these potential exposures, I guess I would be most concerned about the exposure he received from smoking Kent cigarettes.

Q. Did you see anything else in Dr. Horowitz's medical history besides potential asbestos exposure or the mesothelioma that could account for a pleural effusion?

A. No.

Q. When you stated in your book -- by the way, what's the date of the publication of this book?

A. January 1994.

Q. When you stated, as Mr. Ohlemeyer read, no evidence cigarette smoking causes mesothelioma, what did you have in mind?

A. What I was saying or trying to say in there, maybe I didn't say it very well, was that there was no evidence that cigarette smoke, per se, causes an increased incidence or a decreased incidence of mesothelioma.

And also, that book was published before this data became available. But that was not specifically trying to imply that cigarette smoke was not important in causing mesothelioma, if some type of cigarette contained asbestos that people were going to get into their lung tissue. That was saying that the fact that people smoked cigarettes doesn't seem to have an effect on the incidence of mesothelioma.

Q. Are you aware of any other product containing asbestos besides the Kent cigarette which was designed specifically to be inhaled directly into the lung?

A. Not specifically. The only other thing that I could think of in which asbestos was used where that could have happened would be the gas masks. The gas masks were produced in World War II, and maybe even later, in which they did use crocidolite asbestos. They also used chrysotile asbestos, and I don't know whether or not any of the asbestos in that material was inhaled or not, but the

only agents that I know for sure would be the cigarette.
Q. And the gas masks, is that the same design as the cigarette filter?
MR. OHLEMEYER: Objection, Your Honor; lack of foundation.
THE COURT: If he knows, he can tell us.
THE WITNESS: I don't know the exact design. It's my understanding that the gas mask had that totally enclosed, so none of it would be respirable, but I'm not an expert on the gas mask.
MS. CHABER: Q. Have you looked at literature that looked at the populations who were making the gas masks?
A. The reason I know a little bit about the gas mask was because in the book, that's indicated in there concerning epidemiology and mesotheliomas. And the reason that was included was that it was looking at the incidence of mesothelioma in the people that used chrysotile asbestos for the gas mask filter versus crocidolite asbestos. And there was a much higher incidence in the people that used crocidolite asbestos versus chrysotile.
Q. And in a person exposed to asbestos, what is the most likely cause of mesothelioma?
A. Asbestos is.
Q. And assuming that an individual did not have therapeutic radiation for some other disease -- and what were some of the other potential causes of asbestos?
A. Aronite and a few of these anecdotal cases of peritoneal injury from trauma, various infectious-type

diseases.
Q. And assuming a person did not have an infection in the lung area, the pleural area, was not exposed to aronite, did not have therapeutic radiation in the area of the pleura and was exposed to asbestos, what's the most likely cause of the mesothelioma?
A. Asbestos is.
Q. When you and Dr. Dodson did studies on the concentration of asbestos in the lungs, did you use double blind studies?
A. No.
Q. And why not?
A. From a practical point of view, it's a matter of time, time considerations, that if you were to do everything in a double blind manner, that would take a lot of extra time, it would take extra people to do that study, it would cost more to do it.
And I think that a lot of studies are done in a nondouble blind type of way; especially pathology-type studies would be a good example, or when you're trying to

test something. You basically do these studies to try to find out something. You have a hypothesis, and if it turns out the hypothesis is wrong, that's the way it is, but you try to do that as accurately as you can, and you try to do it in a way that you think is the correct way.

And because you don't have a double blind study doesn't mean that the results are not accurate and that you not are doing this in an objective type of manner.

Q. And I think you mentioned that the use of controls was important when you're doing a study; is that true?

A. Controls are always important. In the study that we are doing with Dr. Dodson, the controls that we have of are of people that have not been exposed to asbestos, that have nonasbestos related diseases or who died from trauma, and it's always important to have that information to know what the background concentration of, say, asbestos was or is in a control population. It's very important to have controls.

It's absolutely necessary.

Q. And did Dr. Longo use controls?

A. He did, yes.

Q. And what kind of controls did he use?

A. According to his paper, he used six control samples; 1991 Kent cigarettes were smoked and analyzed in the same manner as the 1950 cigarettes. And then he said three blank samples, which was mentioned by one of the attorneys, which one a blank sample would be where there wouldn't be any smoke coming through it were also analyzed, according to the same way.

Q. And what's the importance of doing that?

A. Well, he did what he thought was the correct way to compare the Kent cigarettes that had the potential asbestos-containing filters. He took Kent cigarettes that were produced in 1991 that did not have the asbestos-containing filters, and see if he found any asbestos in the smoke of those cigarettes.

Q. And assuming he had found some asbestos in the smoke

of the 1991 cigarettes, could you draw any conclusions from that?

A. Well, if he did, then he would have to go back and evaluate the whole experiment again to see if he had maybe some type of contamination, to see if there was some other type of substance in that cigarette that may have contained asbestos besides the filter. He would have had to look at the entire apparatus again and look at the entire experiment to see where potential contamination may have come or that asbestos was from another source.

Q. And did Dr. Longo find asbestos from the controls from the 1991 cigarettes?

A. No.

Q. Now, you were asked about the page charges.

Journals
15 do sometimes require page charges?
16 A. It's very common for page charges to be levied
against
17 authors, and it defrays the cost of publication. And
18 another -- some journals, and I said this in my
deposition,
19 one journal called the American Journal of Critical Care
20 Medicine and Respiratory Disease, or something along that
21 lines, charges you a $50 fee up-front when you submit an
22 article just for the handling charges. So it's not that
23 uncommon for page charges to happen.
24 What I have found is that if you have an article
25 accepted in a journal and then you order reprints of that
26 article, which would be something like this, but it would
be
27 the exact way it would look in a journal, and that might
28 cost anywhere from a couple hundred to, say, $1,000, is
that

1 they usually then would not charge you the page charges.
2 Q. And did you review anything from Cancer Research that
3 addressed the issue of whether or not in spite of requiring
4 page charges to defray publication costs, Dr. Longo's
5 article was peer reviewed?
6 A. I did.
7 Q. And what did you conclude from that?
8 A. There was a letter from the editor or associate
9 editor, or somebody from Cancer Research, that indicated
10 that that article was peer reviewed, and the fact that
11 Dr. Longo paid page charges did not in any way detract
from
12 the scientific validity of that article.
13 Q. Do you recall how much these page charges were? Is
14 this a money-making operation to publish in the journals?
15 A. I don't think it's a money-making operation. I
think
16 it's just basically, again, publishing charges are
17 increasing, and I think the publishers probably want to
18 basically break even or make a small profit, and that's
part
19 of the way they do it.
20 Q. And is Cancer Research a reputable publication?
21 A. It is, yes.
22 Q. Now, Dr. Longo, did he disclose anything about who
had
23 asked him to do this work when he published this article?
24 A. He did.
25 Q. And what did he say?
26 A. He said, in footnote number one in the left-hand
27 corner of this paper, right there he said: "This work was
28 supported in part by plaintiffs' lawyers. The authors

1 exercise full control over the design and execution of the
2 study, as well as the interpretation and reporting of the
3 study results."
4 Q. And what's the significance of somebody disclosing
who
5 has asked them to perform a study?
6 MR. OHLEMEYER: Objection, Your Honor.
7 THE COURT: Overruled.

MR. OHLEMEYER: She can ask this witness in his mind what it is, but in general, it's speculation.
THE COURT: Restate it, then.
MS. CHABER: Q. Dr. Hammar, has there been some controversy with respect to the publication of scientific and medical literature as to who helped finance the studies that are reported?
A. There has, yes.
Q. And what is that controversy?
A. Well, the controversy has been something like if a company, say a corporation or somebody who may potentially have a bias to have the information come out in a certain way publishes or pays for that scientific research, that they are going to want to have that data come out in a way that is advantageous, potentially, to them.
And this is something that's been going on now for several years and something that has created some controversy and is something that I think has concerned quite a few people.
Q. And what was the concern that somebody was paying for work to be done?

A. Paying not so much I think for work to be done, they were doing that, but they were paying in a way or had an indirect type of pressure on the person to produce results that were favorable towards the side of the person who was paying for the research.
Q. And what is the significance of disclosing that in a scientific paper?
MR. OHLEMEYER: Same objection, Your Honor. I think it has --
THE COURT: Well, to him. Restate it on a personal basis.
MS. CHABER: Q. What is the significance in your mind, Doctor, of disclosing who has asked the work to be done?
A. In my opinion and what I personally believe, that is a highly ethical thing to do, and it should be done by everybody whoever does research that's paid by some type of, say, corporation or some type of institution in which they might think there's a bias. Because at least if that person puts that up-front, everybody knows about that from stage one and nobody is concerned or confused about that.
And I think, also -- again, this is personally speaking -- is that if I did that, then I would even want to be more than ever certain that the results in there were as objective as they possibly could be. That's my personal opinion.
Q. And in your deposition that Mr. Ohlemeyer was reading from in October of 1994, you recited suggested protocol for doing a smoking study. I think he asked you a whole series

of questions about that?
A. Right.
Q. Do you know if Lorillard has ever attempted to conduct such a study as you described in there to see whether or not Kent cigarettes would release asbestos into the smoke?
A. It's my understanding, from the way I can tell, if I'm supposed to --
MR. OHLEMEYER: Objection, Your Honor. The witness either knows or he doesn't.
THE COURT: Yes, it's either yes, no, or you don't know.
THE WITNESS: Yes.
MS. CHABER: Q. And what is your understanding?
A. That the Lorillard company did know that crocidolite asbestos was in the cigarette smoke.
MR. OHLEMEYER: Your Honor, I think that's nonresponsive. The question and answer are --
THE COURT: All right. Ask the question again.
MS. CHABER: Q. Dr. Hammar, what is your understanding of whether or not Lorillard ever tested Kent cigarettes containing crocidolite asbestos to see whether or not the smoke from it contained crocidolite asbestos?
A. It's my understanding that they did.
Q. And let me --
MR. OHLEMEYER: Your Honor, I'd like to ask a few questions on voir dire, then, to form my objection.
THE COURT: All right.

VOIR DIRE EXAMINATION BY MR. OHLEMEYER
MR. OHLEMEYER: Q. Dr. Hammar, have you ever talked with anybody at Lorillard about this product?
A. No.
Q. Okay. Have you been provided with information from plaintiff's lawyers that they have obtained, in connection with this lawsuit, or any other proceeding that they have given to you to look at?
A. Not plaintiffs lawyers, defense lawyers.
Q. So the only thing you know about what Lorillard may or may not have done in the 1950s with this product is something that's been given to you in connection with either litigation involving Lorillard or litigation involving other asbestos companies?
A. It was litigation involving Lorillard.
MR. OHLEMEYER: Well, Your Honor, that's not a reasonable basis for reliance from this witness for an expert opinion about what Lorillard did or didn't do.
THE COURT: She didn't ask for his opinion on it, she asked him if he knew of studies done by Lorillard.
MR. OHLEMEYER: Then everything he knows is hearsay, and this witness is not here to recite what may or may not be in Lorillard's files or what may or may not be shown to him by other lawyers.
THE COURT: I don't know what the source of the

information is because that's all he's asked. Let's see what the next question is.

CONTINUED REDIRECT EXAMINATION BY MS. CHABER

MS. CHABER: Q. Dr. Hammar, assume that in 1954 Lorillard hired an electron microscopist to look at smoke from Kent cigarettes with an asbestos filter. And assume that photomicrographs were taken looking through the electron microscope at the smoke that was collected.

And assume further, Dr. Hammar, that the photomicrographs from the Kent cigarettes smoke that had asbestos looked like Plaintiffs' Exhibits 11, 12 and 13.

Based on that information, Doctor -- let me just ask you, based on that information, does that have any effect on your opinion as to whether or not Dr. Longo's findings are valid?

MR. OHLEMEYER: Your Honor, I object to the hypothetical. It includes facts that have not, will not be proved, and I'd like an instruction under 403 and 405 as to what use the jurors are to make of this opinion. And it's also outside the scope of my cross-examination.

THE COURT: Sustained.

MS. CHABER: It goes to the article, Your Honor.

THE COURT: Sustained.

MS. CHABER: And he asked questions about these photographs.

THE COURT: All right. But rephrase the question.

MS. CHABER: Okay.

Q. Dr. Hammar, looking at those photographs, have you attempted to make any comparison between those photographs and what Dr. Longo has published in his article?

MR. OHLEMEYER: Same objection, Your Honor. It's

beyond the scope of the cross-examination. The photographs were used in connection with questions about laboratory techniques, blanks and controls.

THE COURT: Overruled.

THE WITNESS: Yes.

MS. CHABER: Q. And in your opinion, how do they compare?

A. They are similar to the photographs shown in figure four of Dr. Longo's article. Specifically, the individual fibers have resemblance to the fibers shown in figure four of the article.

Q. Doctor, you were asked some questions about levels of exposure that cause mesothelioma, levels of exposure to asbestos that cause mesothelioma?

A. Yes.

Q. Has there been any look at populations that have been exposed solely to crocidolite asbestos with respect to the levels necessary to cause disease?

A. Yes, to a certain degree. It's not been quantitated, but it has been described with respect to what certain individuals did who developed mesothelioma who had certain types of exposures.

Q. And can you give us some examples?
A. Yes, two examples. One would be the study that first
came out of South Africa, published in the British Journal
of Industrial Medicine in 1960 by Wagner, Shregs (phonetic)
and Marshand.
And in that article they described 33 cases of

mesothelioma in people who lived in the Cape province of
South Africa. And 32 of the 33 papers patients were
suggested to have asbestos exposure in that article,
specifically to crocidolite.
And what was of interest in that article was that many
of the people who developed mesothelioma, who were described
in that paper, had what I would consider very trivial
exposures, very small exposures.
Q. And when you say "small exposures," can you give us an
example of how they were exposed?
A. One person who developed mesothelioma described in
that article, for example, was an accountant who lived in a
town called Kimberly, which was an area where asbestos could
have been passed through, or he was in an area where he
could have been exposed to asbestos being transported from
the mines to where it was exported -- transported.
There were other examples of other people who had
exposures similar to that or did not directly work with the
asbestos, as far as miner or a miller, who developed
mesothelioma.
And my other experience is from Australia from the
Wittenoom mine, and that's been studied very extensively by
pathologists that I know in Australia, Doug Henderson
specifically, in which they have found, basically, the same
thing; that there have been some individuals who have had
very small exposures, as they have described it to me, who
have developed mesothelioma.
Q. And these would be small exposures to crocidolite?

A. Crocidolite, yes, that's the type of asbestos they
mined in Western Australia.
Q. And you were asked some questions about thresholds and
thresholds of exposure to cause disease. Has the thresholds
changed over time where people draw the line?
A. Most of the thresholds were instituted for asbestosis
and not for cancer. And I think the thresholds for
asbestosis certainly has changed over time. And the
thresholds for cancer, I think as people have known more,
those thresholds have changed, too.
There are certain opinions that are expressed by
certain individuals with respect to what thresholds it takes

13 to produce, say, asbestosis, lung cancer, mesothelioma. And
14 what I'm looking at is the pathology type of exposures or
15 concentrations they have in their lung tissue. And there's
16 quite a bit of good data on that.
17 Q. And the pathology and what is in the lung tissue, is
18 something, with respect to Dr. Horowitz, we are going to
19 have to wait until he dies to find out?
20 A. That's correct.
21 MS. CHABER: I don't have anything further.
22 MR. OHLEMEYER: Just a few, Your Honor.
23 RECROSS-EXAMINATION BY MR. OHLEMEYER
24 MR. OHLEMEYER: Q. Dr. Hammar, you are and have been
25 involved in cancer research?
26 A. Yes.
27 Q. And you are and you have been involved in research
28 related to mesothelioma?

1 A. Pathology research, yes.
2 Q. And you don't have any current intention of
3 discontinuing that research?
4 A. No.
5 Q. And that's because there remains a lot to be learned
6 about cancer and mesothelioma?
7 A. That's correct.
8 Q. For as much as we know today about cancer and
9 mesothelioma, there's a lot we don't know?
10 A. That's true.
11 Q. And part of this process, I think you said earlier,
12 was coming up with a hypothesis and doing a test?
13 A. Testing a hypothesis, yes.
14 Q. And a hypothesis is an opinion or an idea?
15 A. It's an idea I think based on -- usually on scientific
16 facts that one has gained from previous work.
17 Q. But it's an idea that remains to be proved?
18 A. That's true.
19 Q. And the way you test it or the way you prove it is to
20 conduct an experiment?
21 A. That's correct.
22 Q. And then if the results of the experiment support your
23 hypothesis, you will reproduce or repeat the experiment to
24 make sure that your results weren't random or by chance?
25 A. Yes. What often there initially is, is what's called
26 kind of a -- I'm trying to think of the right word --
27 initial study to see if something might work.
28 The lung cancer study group, in 1977 we were trying to

1 determine if immunotherapy was good for lung cancer, and the
2 initial studies suggested that it was. We did a very
3 careful, controlled study to further evaluate that, and it
4 happened to turn out it wasn't, but that's what you kind of
5 do.
6 Q. And one of the things you do in connection with all

of
this, you produce a written protocol or a plan for how you're going to conduct your study?
A. That's correct.
Q. And that's so when you finish your study, you can publish it, you can let somebody else take your plan and see if they can get the same results using your plan?
A. That's true. That's done, yes.
Q. And there have been a lot of ideas and a lot of hypotheses and a lot of data and experiments that have been published over the years that have turned out to be wrong?
A. That's probably true, also. I think that most of those probably are early phase studies, but that's true.
Q. And based on the best available evidence, people come to a conclusion, and it may turn out later that their conclusion was wrong?
A. That's always possible, yes.
Q. Now, fiber burden analysis is the most reliable way to attribute a cancer to asbestos exposure?
A. I happen to believe that's correct, yes.
Q. And that's because when you do fiber burden analysis, you know exactly what concentration of asbestos is in the lung tissue, and you know whether it's greater than you

expect to find there?
A. That's correct.
Q. And without an elevated fiber burden, you would not generally state that a cancer was related to exposure to asbestos?
A. I wouldn't. If you had that data, and say if we had Dr. Horowitz's lung tissue right now and we did not find a concentration of asbestos over background, I would not say that his cancer was related to asbestos.
Q. And in your practice in Washington in your hospital, if I brought Dr. Horowitz's medical records to you and I brought you the x-rays and I brought you the pathology slides and I did not bring you fiber burden evidence of an elevated level of asbestos, you would not state that his cancer was related to asbestos?
A. If I had the history that I have with this case, I would. I would say that it's my opinion, based on the best evidence, that his mesothelioma was caused by asbestos, as I understand his exposure to asbestos.
If I had a situation where I had that history and I also had fiber burden analysis, and the fiber burden analysis showed that he did not have crocidolite in his lung tissue and did not have an elevated concentration of asbestos in his lung tissue, then I would say that his mesothelioma was not caused by asbestos.
Q. And the fiber burden is objective evidence?
A. Right.
Q. And the history that you have is subjective evidence?

A. That's true.
Q. It can be affected by failure of memory?
A. That's possible.
Q. It could be affected by the passage of time?
A. That's probably true, also.
Q. It can be affected by ignorance, people may not just have enough information to know what they may or may not have been exposed to?
A. That's correct.
Q. And sometimes it can be affected by the motivation they have in recalling the history?
A. Well, I don't know. I don't know. I guess I am the type of person that I believe people are basically honest and wouldn't do that.
Q. Well, sure, but that's something that can affect people's -- the accuracy of their history?
A. I guess I look at myself. I don't think I would do that, and I don't think I would assume that another person would do that. I just don't think in the long run that benefits them, anyway. I think that causes them more grief and more trouble than it would cause them benefit.
Q. But the history and the information you have is all subjective, and it came from a man by the name of Ray Goldstein, and it came from the summary of Mr. Horowitz's deposition prepared by Dr. Horn?
A. Yes. And I guess that is subjective, and I happen to believe it, but maybe it is subjective.
MR. OHLEMEYER: Thank you, Doctor.

THE COURT: Thank you.
MR. BRAKE: Very, very briefly, Your Honor.
RECROSS-EXAMINATION BY MR. BRAKE
MR. BRAKE: Q. Just two quick things.
You had told us the reason Dr. Longo -- I just want to make sure I understand, the reason Dr. Longo disclosed in his article that his work was supported in part by plaintiffs' lawyer group was to be ethical and let the world know that fact, because it was a relevant fact?
A. I don't know why the reason it was. I think that that's what it did, and I think that was a very good thing to do. Maybe the publishers of the article made him do that. I don't know.
Q. But the world can then take into account the fact that the work was supported by plaintiffs' lawyers?
A. I think if that information is up-front and he discloses it, then everybody knows it and everybody can draw their own conclusions, but it's something that's not hidden, and I think it's very good that he did that.
Q. The other thing, I had meant to bring that Wagner article, 1960, and I didn't do it, but have you got it over there?
A. No, I don't have it with me today.
Q. I almost brought it, but let me just ask you this:

He
25 found 33 cases of mesothelioma in South Africa; right?
26 A. Right.
27 Q. And didn't most, if not all, of those people live
for
28 some time near an open crocidolite mine?

1 A. Not all of them, no.
2 Q. Did most of them?
3 A. It depends how you define "most." As I recall, about
4 slightly less than half did not. Slightly less than half
of
5 those people would have what I considered relatively small
6 exposures.
7 Q. Asbestos exposure to the people that lived near the
8 open crocidolite mine, that a trivial exposure, is it?
9 A. No, there were some that did work in the mine, some
10 that worked as millers.
11 Q. And some who lived near the mine?
12 A. There were some who lived near the mine, there were
13 some children who developed mesothelioma who worked in the
14 tailings that later got mesothelioma. There was a case
not
15 included, that of a housewife who later got mesothelioma
who
16 was exposed.
17 Q. Now, as to the account that you told us about, you
18 really don't know, as you sit here today, 36 or so years
19 later, where he may have been otherwise exposed to
asbestos;
20 right? You don't know the occupational history or
anything
21 else about the man?
22 A. I guess you could say that for almost anything. No,
I
23 don't, but I guess you also maybe have to believe some
24 things, and that's okay.
25 MR. BRAKE: Thanks, doctor.
26 MS. CHABER: I don't have anything more.
27 THE COURT: Any member of the jury have a question?
I
28 guess you've answered them all.

1 THE WITNESS: I don't know about that.
2 THE COURT: Okay. Are you through with the doctor?
3 MS. CHABER: Yes.
4 THE COURT: He's free to go?
5 MS. CHABER: He's free to go.
6 MR. OHLEMEYER: Yes, Your Honor, he may be excused.
7 THE COURT: Ladies and gentlemen, we will take the
8 evening recess at this time until tomorrow morning.
9 MS. CHABER: Can we approach sidebar for one second
10 before you let the jury go?
11 (Sidebar conference.)
12 THE COURT: Ladies and gentlemen, we will take the
13 evening recess at this time. Please keep in mine the fact
14 that you are not to form an opinion about the case, and
you
15 are not to discuss the case either amongst yourselves or
16 would anyone else. And if anyone approaches you to
attempt

to discuss the case, please advise the Court of that fact at once. We are not going to meet until 10:00 o'clock tomorrow. Sleep in a little bit. 10:00 o'clock tomorrow, please.

(Whereupon, court was in recess.)

REPORTER'S CERTIFICATE

I, JOANNE M. FARRELL, A Pro Tempore Court Reporter of the Superior Court of the City and County of San Francisco, State of California, do hereby certify that I correctly reported the within-entitled matter and that the foregoing is a full, true and correct transcription of my shorthand notes of the testimony and other oral proceedings had in the said matter.

Dated this 10th day of August 1995
San Francisco, California

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JOANNE M. FARRELL, CSR# 4838